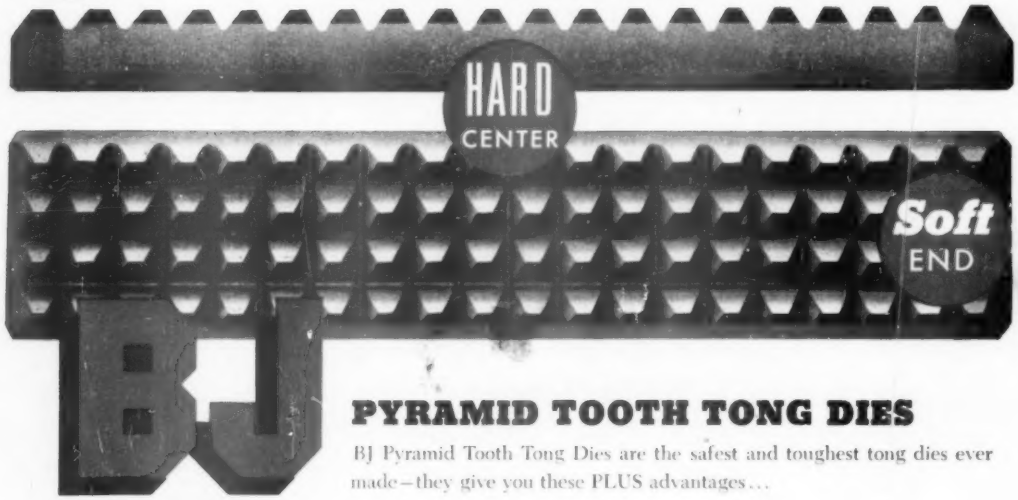
the OIL AND GAS JOURNAL

Safest to use! Safest in use!



PYRAMID TOOTH TONG DIES

BJ Pyramid Tooth Tong Dies are the safest and toughest tong dies ever made—they give you these PLUS advantages...

EXTRA SAFETY — non-chip soft ends are safer, easier to use—

WON'T CHIP — no eye injuries or other accidents on the derrick floor—

TOP ECONOMY — you use fewer dies, make fewer changes—

REVERSIBLE — turned end-for-end, they do twice as much work—at no extra cost—

A POSITIVE GRIP — grips instantly—sharp pointed teeth won't slip—

Made for all rotary and casing tongs—stocked by supply stores in every field. Look for the red box with the big BJ—and for safety and economy, insist on the best—buy BJ!

BJ
MEANS ENGINEERED OIL TOOLS

Byron Jackson Co.

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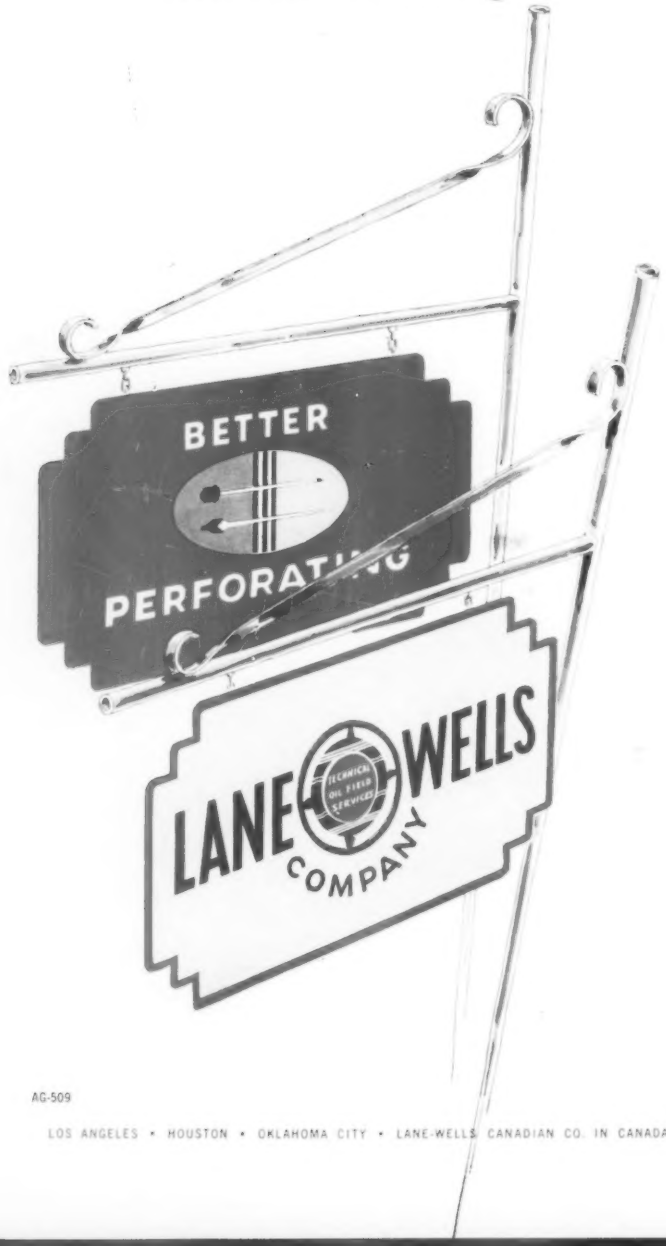
Tomorrow's Tools Today!

To the oil country both signs say the same thing



The oil country is familiar with that hanging sign which marks many of Lane-Wells 71 branches. But if you changed those signs to the second pattern shown here... BETTER PERFORATING... the oil country would still read them as LANE-WELLS. And for several good reasons!

First, *experience*... gained in 175,000 perforating jobs in every oil field in this country. Next, *equipment*... engineered and built in types and sizes to meet every job, and do it right. *Accuracy* in depth measurements to put the perforations where *you* order them. *Combination perforating*... bullet plus Koneshot... for the difficult jobs. *Service* from 71 locations.

Operators can tell you...
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and get the job done-RIGHT

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THE OIL AND GAS
JOURNAL
Vol. 51, No. 17

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- Shop-Field Erection of 1,500-Bbl. Storage Tank.
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First Aid for Cat Crackers Anywhere

IF YOUR CAT CRACKER DEVELOPS ILLS OR YOU HAVE A TECHNICAL PROBLEM ON CATALYSTS, A FILTROL ENGINEER IS READY TO SERVE YOU ON SHORT NOTICE. IN A RECENT 30-DAY PERIOD OUR ENGINEERS GAVE TECHNICAL FIELD ASSISTANCE AND PERFORMED LABORATORY EVALUATIONS FOR REFINERS OVER A WIDESPREAD AREA THAT INCLUDED EDMONTON, ALBERTA; MONTREAL, QUEBEC; TULSA, HOUSTON, PHILADELPHIA AND LOS ANGELES.

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Only B. F. Goodrich makes the grommet belts that cut costs 20 to 50%!

Save 3 ways! Investigate today! Write or mail coupon

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

What is a grommet?

A grommet is like a [illegible] cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Send for proof

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted other. Some typical cases:

". . . within a few days ordinary belts had stretched . . . After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all . . ."

"Ordinary belts lasted only 5 or 6 weeks . . . B. F. Goodrich grommet belts are in their sixth month of service . . ."

"Previous belts suffered from shock loads, wore out fast . . . BFG grommet belts have been in service 2 years with no shut-downs . . ."

There are hundreds of cases like these.

They cost no more

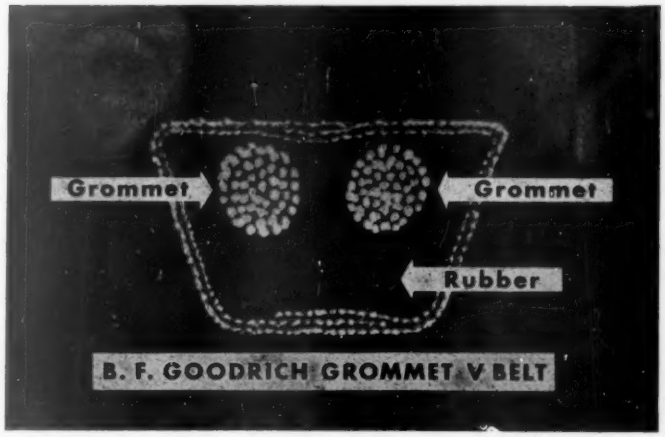
BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

Grommet V-Belts BY

B.F.Goodrich

FIRST IN RUBBER



The B. F. Goodrich Company
Dept. OJ-9
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name_____

Firm Name_____

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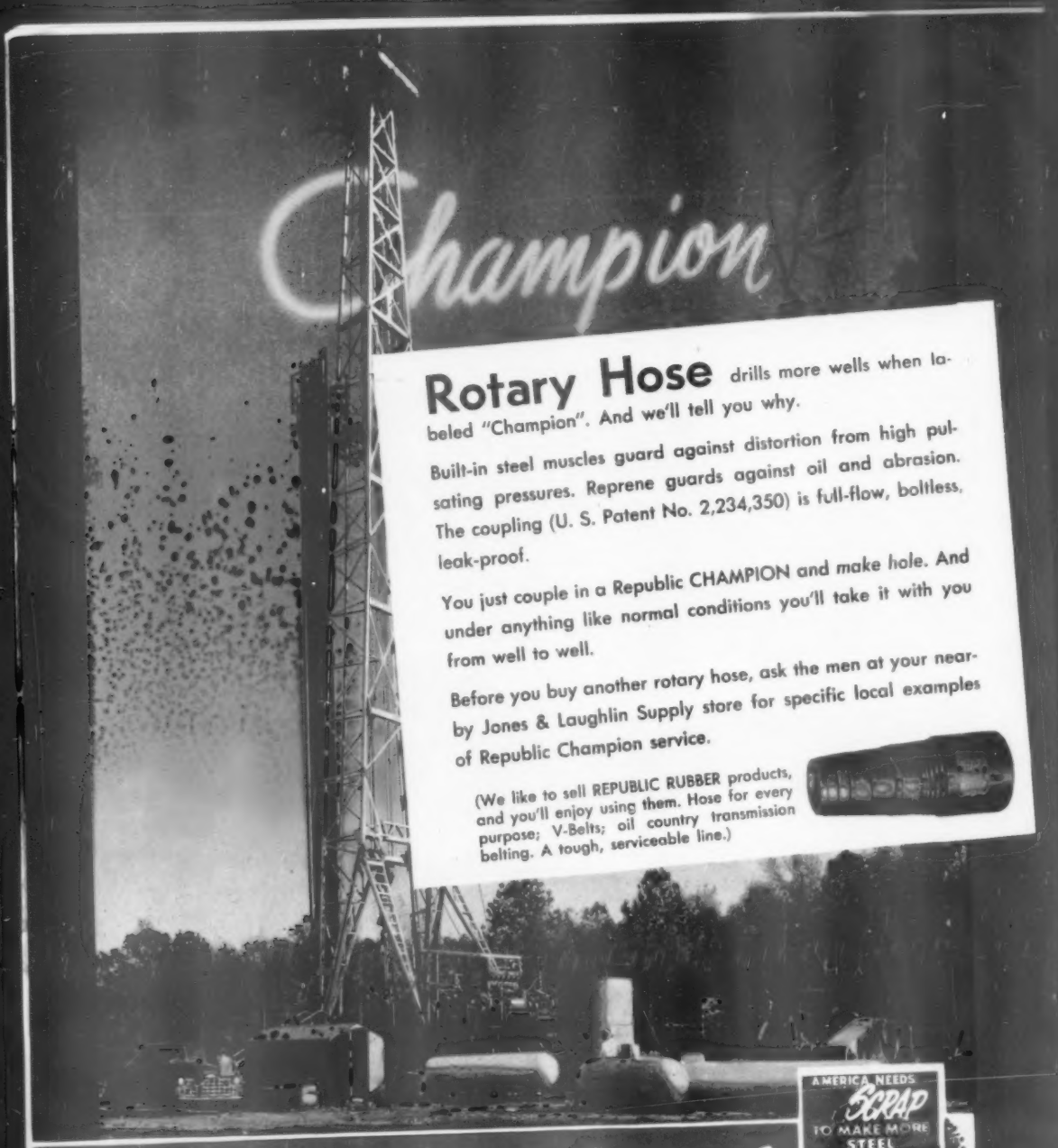
City_____

State_____



Rotary Hose drills more wells when labeled "Champion". And we'll tell you why.

Built-in steel muscles guard against distortion from high pulsating pressures. Reprene guards against oil and abrasion. The coupling (U. S. Patent No. 2,234,350) is full-flow, boltless, leak-proof.

You just couple in a Republic CHAMPION and make hole. And under anything like normal conditions you'll take it with you from well to well.

Before you buy another rotary hose, ask the men at your nearby Jones & Laughlin Supply store for specific local examples of Republic Champion service.

(We like to sell REPUBLIC RUBBER products, and you'll enjoy using them. Hose for every purpose; V-Belts; oil country transmission belting. A tough, serviceable line.)

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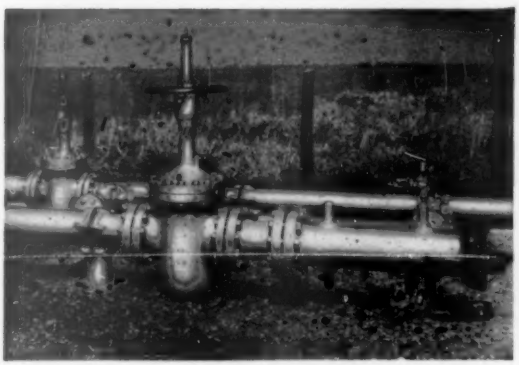
for smoother flow
easier operation
longer service life

...CRANE *CLASS 600*
OIL AND GAS PIPE-LINE VALVES

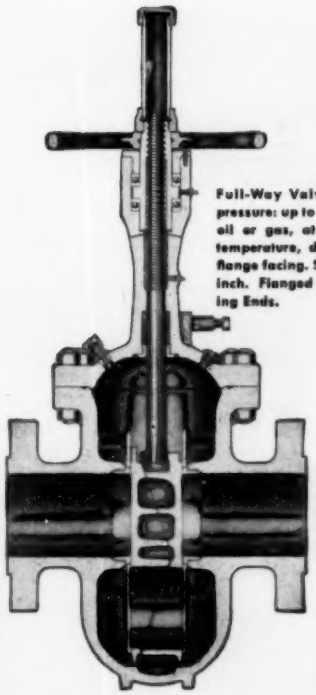
You get many advantages with these conduit-type, double-seating Crane Pipe-Line Gates. For example, smooth, full flow with minimum restriction . . . no turbulence. Circular disc ports—in perfect alignment with seat openings—eliminate pockets. This Crane design feature helps assure tight closure.

Grease packed body and bonnet assure easier valve operation . . . less maintenance. All working parts are lubricated to reduce friction and wear. And since Crane double-seating design seals off seating faces from line flow, seat erosion is eliminated.

For further information, see your Crane Representative or write for Circular AD-1864. No obligation.



Crane cast steel pipe-line gate valves on scraper trap in crude oil lines.



Full-Way Valve. Working pressure: up to 1440 pounds oil or gas, at atmospheric temperature, depending on flange facing. Sizes: 2 to 30-inch. Flanged or Butt-Welding Ends.

COMPLETE GREASE SEALING

Movable spring-loaded plates prevent grease entering line flow while valve is being operated . . . also close "conduit" openings in disc against entrance of grease.

In addition, plates wipe foreign matter and excess grease from disc faces and assist in guiding the disc. Readily accessible fitting in bonnet permits easy addition of grease when needed.

Venturi Type, available with flanged or butt-welding ends.

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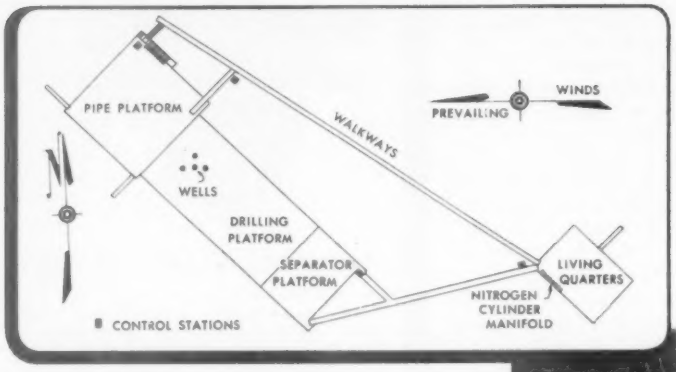
YOU NEED REMOTE CONTROL



They don't take chances in Rollover field, where four high-pressure wells are being produced from a single platform, nine miles off shore in 40 feet of water.

• There are four remote stations on the platform, and the master valve on each well head is equipped with both manual and pneumatic controls which may be operated from either of two stations, independently.

• E-I-M Company's Type G-2 valve controls are a vital part of the Pure Oil Company's safety engineered system.

Progressive pipe liners specify E-I-M Valve Controls.

E-I-M Company INCORPORATED

1340 OLD SPANISH TRAIL • HOUSTON 21, TEXAS • MOhawk 4587

Valve Controls • Speed Reducers • Cooling Tower Drives • Control Valves

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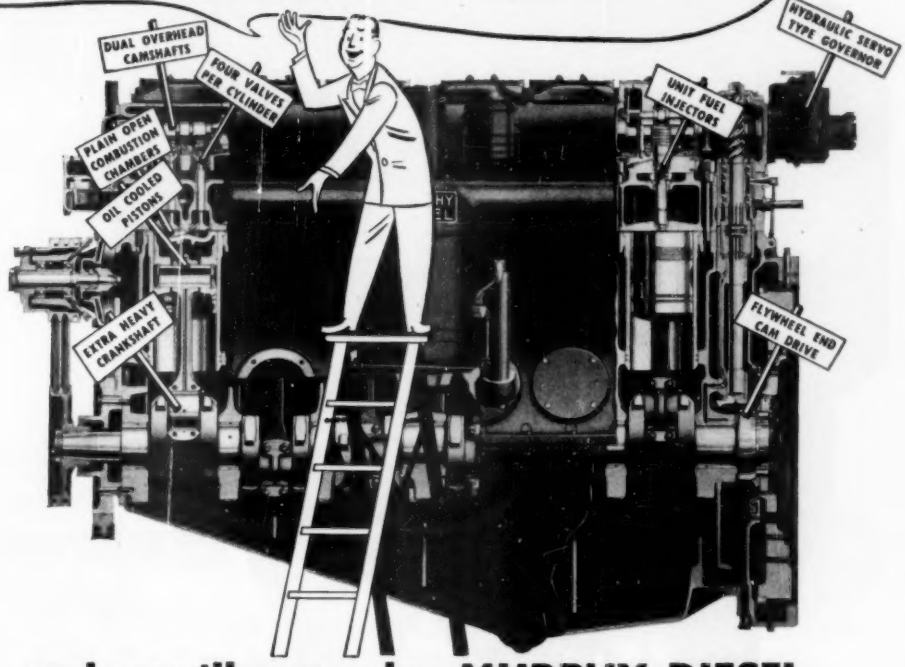

and you'll see why MURPHY DIESEL gives you more power, greater economy and longer engine life...

MURPHY DIESEL

Heavy duty power

for the oilfields

Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 90 to 226 H.P., 1200 and 1400 RPM. Generator Sets, 60 to 140 K.W. Dual-Fuel Engines, 135 to 180 H.P. Also Crude Oil Burning Engines.

FOR the most part, engines look pretty much alike from the outside, but to really judge an engine you have to look inside. The Murphy Diesel isn't afraid of comparison. It offers a combination of proved design advantages available in no other engine. Check these features for yourself and ask Murphy Diesel owners—they'll tell you what these features mean in terms of good heavy-duty power, minimum fuel consumption and long engine life.

Additional information is given in the booklet, *"10 Questions to Ask a Diesel Engine Salesman"*. Ask your Murphy Diesel Dealer for a copy or write direct.

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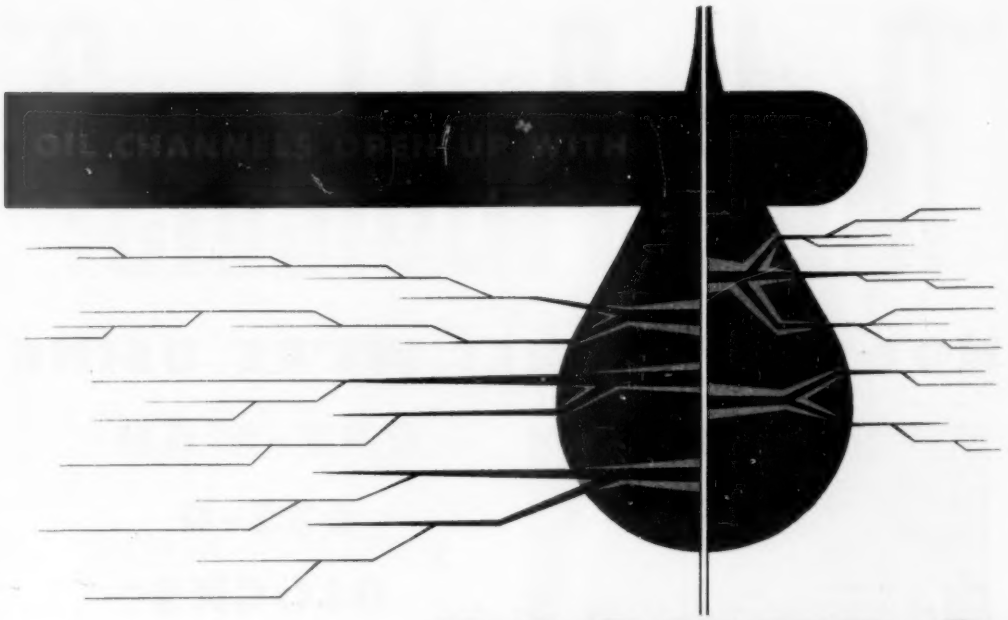

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HALLIBURTON'S POTENT, INEXPENSIVE COMPLETION TREATMENT!

If your well was drilled with water base mud, it may be water blocked or plugged with emulsion and the formation pressure may never clean it out!

MORFLO SEPARATES AND REMOVES BOTH FRESH AND CONNATE WATER. An aromatic sulfanic acid compounded exclusively by Halliburton, Morflo is carried into the plugged zones by light crudes or diesel fuel under normal pumping pressure. Because Morflo is soluble in water but insoluble in oil, the treatment breaks down emulsions . . . separates and removes the fresh and salt water present. Morflo also removes lost mud from permeable formations and helps open new flow channels.

MAKE MORFLO YOUR FIRST COMPLETION TREATMENT—NO SPECIAL EQUIPMENT REQUIRED. The cost is surprisingly economical either as a first completion treatment or a better means of reworking older wells. One brief shutdown normally increases production the first day and for long periods after treatment!

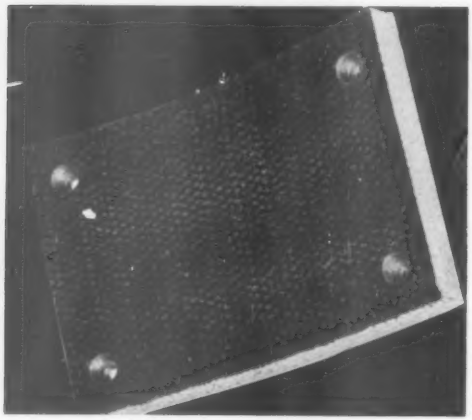
Your nearby Halliburton Representative is ready now to make a careful study of your wells for probable results. Or write Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

YEARS AHEAD IN ACIDIZING!

HALLIBURTON

"Brake Problems?"

NOT ANY MORE! WE'RE USING



RAY-MAN 635-D BLOCKS

Want brake blocks that will feed off smoothly even when handling the heaviest strings of pipe . . . won't carbonize when overloaded . . . won't glaze drums?

Get Ray-Man 635-D Brake Blocks! They're woven of unusually large asbestos yarns, fully impregnated even in the middle of the block. They're strengthened with brass-wire-reinforced yarn in back. They resist bleeding even at high temperatures . . . and they'll certainly give you a new idea of *durability* in brake blocks!

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Key-Lok saves relining time. Eliminates bolt holes, too, thus providing greater friction surface and longer wear. No danger of scoring drums with bolt heads!

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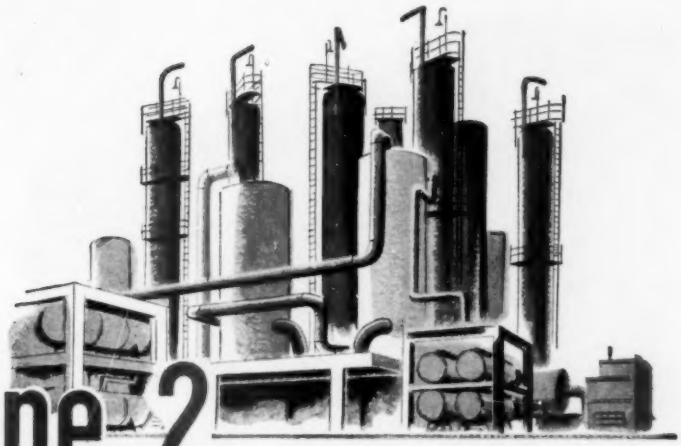

Tenamene 2

inhibitor-sweetening

Cuts costs — eliminates danger of contamination — saves time and equipment

Tenamene 2 inhibitor-sweetening involves the use of this efficient Eastman gasoline additive both as a sweetening agent and as a gum inhibitor, and thereby makes possible the combining of two operations in a single step.

Tenamene 2 appears to act as an oxidation catalyst with regard to mercaptans. Its presence in sour gasoline enables refiners to convert mercaptans to disulfides merely by adding 10-20° Baume caustic and bubbling air through such gasoline at slightly elevated temperatures.

The Tenamene 2 itself is not reacted upon and thus remains in the gasoline after the sweetening process to provide effective protection against the formation of gums.

WHEN TO USE: If you are depending upon a solutizer process and have trouble in economically obtaining "Doctor" sweet gasoline, we recommend that Tenamene 2 inhibitor-sweetening be investigated as an adjunct to your present process. When Tenamene 2 inhibitor-sweetening and solutizer sweetening are combined, a considerable reduction in heat costs and a saving in time and equipment can frequently be realized, due to the decrease in recycling necessary in the solutizer units. The small amount of disulfides remaining in the gasoline after this combination treatment does not seriously affect tetraethyl lead susceptibility.

Where oxidation processes such as Copper sweetening or Doctor sweetening are used, we recommend that Tenamene 2 inhibitor-sweetening be considered as a replacement. While this process is also one of oxidation, it not only eliminates the dangers of copper or free sulfur contamination, but also eliminates the costly regeneration of the treating agents.

HOW TO SWEETEN WITH TENAMENE 2: Sour gasoline is first freed of hydrogen sulfide, organic acids and the more reactive mercaptans by a conventional caustic wash. 4 to 26 pounds of Tenamene 2 per 1,000 bbls. of gasoline are then added along with approximately 10 volume percent of 10° to 20° Baume caustic and air or oxygen. The resulting mix is thoroughly agitated and piped to a settler. The effluent from the settler is handled in the same manner as the effluent from conventional sweetening units, except that no more inhibitor is required.

Whatever your present sweetening process, it will pay to investigate Tenamene 2 inhibitor-sweetening. The staff of our gasoline laboratories will be pleased to work with you in determining how this process can be most effectively used in your refinery. Contact your local representative or write to Tennessee Eastman Company, Division of Eastman Kodak Company, Kingsport, Tennessee.

Tenamene **EASTMAN GASOLINE ADDITIVES**

SALES REPRESENTATIVES: New York—260 Madison Ave.; Framingham, Mass.—7 Hollis St.; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; St. Louis—Continental Bldg.; Houston—412 Main St. **West Coast: Wilson Meyer Co.,** San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Seattle—821 Second Ave.

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Heat-Transfer Surface

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

- **High Efficiency**
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- **Low Maintenance Costs**

You are assured of high efficiency in heating or cooling — long service life — low maintenance and service costs, when you specify Aerofin extended-surface heat exchangers.

The reason is obvious: Aerofin makes heat exchangers *exclusively* — offers you the results of unequalled experience, unequalled production facilities, unequalled materials testing and design research — and the guidance of a complete, highly skilled engineering staff, at the plant and in the field.

For the most practical solution to your heat-exchange problem, ASK THE AEROFIN MAN.

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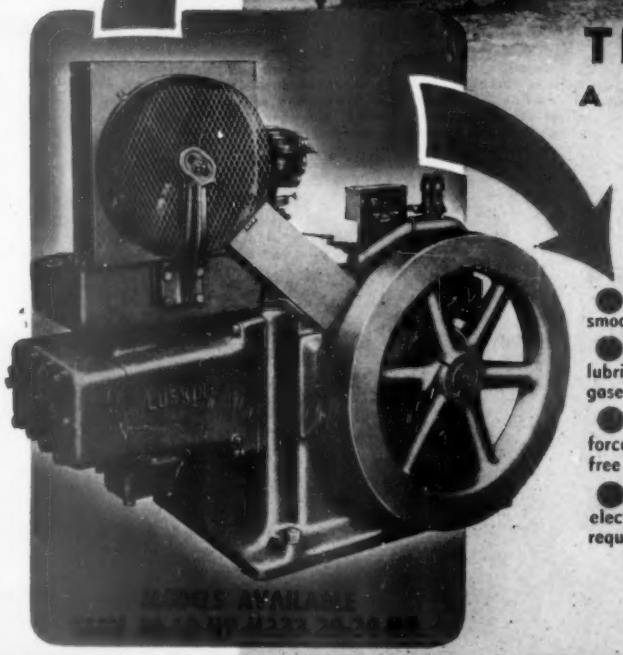
Lufkin ENGINES



THE *Lufkin* H333
A DEPENDABLE RUGGED 20-30 HP OIL FIELD ENGINE

Lufkin engine-unit combination means one responsibility—one source for your entire surface pumping equipment. Fifty years of know-how in manufacturing oil field equipment is your assurance of satisfactory, long-life, low upkeep, and dependable service. The Lufkin H-333 gas engine is built around the needs of the oil fields.

- Two cylinder, two cycle, crosshead design for smoothness and long life.
- Condenser cooling for more efficient cooling and lubrication. High even temperatures desired for sour gases are maintained. No water pump troubles.
- Full pressure lubrication with oil under pressure forced to all wear points for longer life and trouble-free service.
- Easy starting by hand. Optional: Built in 12-volt electric starting system, or air-gas motor starting requiring only 25# gas pressure.

Lufkin engines can take it, which has been proven in the field over many years of continuous operation. We invite you to write direct or check with your nearest Lufkin representative for information and delivery.

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LUFKIN, TEXAS

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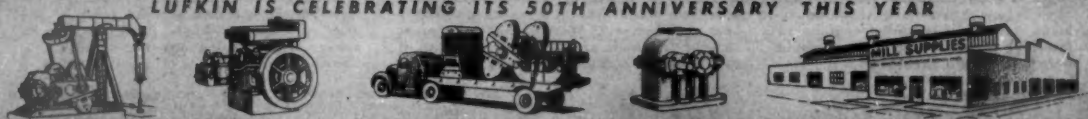
Lufkin Equipment in CANADA is handled by

THE LUFKIN MACHINE CO., LTD. 14321 108th Avenue, Edmonton, Alberta, Canada.

LUFKIN IS CELEBRATING ITS 50TH ANNIVERSARY THIS YEAR



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Full Plug
Bronze Globe Valve

• High test bronze body and bonnet; nickel-alloy disc and seat ring; high tensile, high torque rolled bronze stem—plus large, deep stuffing box easily repacked under pressure—these are the features which make R-P&C Bronze semi-plug and full-plug Globe and Angle Valves outwear ordinary valves. They're fine for frequent or continuous throttling of steam, gas, oil, water. This type valve can be furnished in 200, 300 and 350 lb. pressures.

See your R-P&C distributor for information on the complete line of R-P&C valves or write nearest district office.

R-P&C valves

ACCO

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

PETROLEUM CHEMICALS DIVISION
NEWS

September ★ *One of a Series of Interest to the Petroleum Industry* ★ *1952*

HAVE YOU

recently taken advantage of the services offered to refiners by the 5 Du Pont Petroleum Chemicals Division district laboratories?

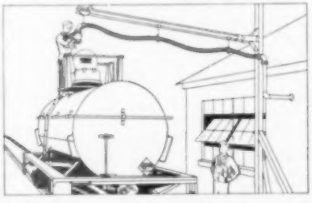
Here is a list of some of the services available:

1. Tetraethyl lead blending studies
2. Lead content analysis
3. Laboratory octane ratings
4. Road octane ratings
5. Antioxidant evaluations
6. Metal Deactivator recommendations
7. Dye selection
8. Recommendations in connection with fuel oil, lube oil, and grease additives problems

Ask your Du Pont Petroleum Chemicals Division representative for further information on how the district laboratories can be of help to you.

Easy Maintenance, Plus Added Safety, Marks Du Pont-Designed Metal-Flex Hose

With numerous installations already in use, the Du Pont-designed Metal-Flex unloading swing line has definitely proved its outstanding advantages.



Hardly any maintenance is required to keep the hose in working condition. This, added to the fact that only one man is required to connect and operate it, means that a Metal-Flex installation pays for itself in a very short time in lower labor and maintenance costs.

Refiners who have tested and used the Metal-Flex unloading swing line for a period of years report, moreover, that it is safer than any other type of unloading connection for TEL handling. Because it holds vacuum exceptionally well, it eliminates the minor leaks that so frequently result in unloading difficulties when rigid swing lines are used.

WEATHER RESISTANCE

Metal-Flex hoses have been installed all the way from Houston, Texas to Winnipeg, Canada. Throughout this wide range of weather and climate conditions they have been found to operate smoothly and easily at all times—in sleet and snow as well as in warm weather.

The Metal-Flex design was developed and built by Du Pont as a service to refiners who were expressly looking for a safer, more convenient connection that would overcome certain specific unloading problems.

Strategically Located Du Pont Rail Sidings Help Meet Emergency Needs for TEL Shipments

Whenever you have a "hurry-up" need for tetraethyl lead that has not been anticipated in your regular delivery schedules, there is a Du Pont TEL tank car loaded and waiting at a nearby rail siding ready for immediate delivery to your refinery. Primarily for emergency use, the Du Pont "rolling warehouse" facilities include seven rail sidings in addition to the plant storage area, as well as two tank truck terminals strategically located throughout the country.

THIS MAP SHOWS how the Du Pont TEL tank car sidings and tank truck terminals are conveniently located in, or adjacent to, major refining areas.

The TEL *tank car* facilities serve refiners from railroad sidings in Torrance and El Monte, California; Houston and Beaumont, Texas; East Chicago, Ill.; Kansas City, Mo.; Toledo, Ohio; and Carney's Point, N. J. The *tank truck* terminals, at El Monte, Calif., and Carney's Point, N. J., are complete with weigh tanks and storage facilities and make it possible for refiners to receive rush shipments of TEL in smaller-than-tank-car lots.

FOR EMERGENCY USE . . .

The main purpose of this nation-wide Du Pont TEL distribution set-up is to keep on hand an adequate supply of tetraethyl lead to supplement regularly scheduled deliveries that may have been held up by floods, train accidents, strikes or other unforeseen circumstances.

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED

Rail Sidings

CONVENIENCE, TOO!

A second advantage of these siding and terminal facilities is the convenience they provide refiners who may need *additional* supplies of tetraethyl lead on a moment's notice . . . for rush orders or to meet unusually big commitments.

An ample supply of both Motor Mix and Aviation Mix is always maintained. And there is someone at the phone to expedite your order at any time of the day or night. Deliveries are fast, too. Most requirements can be filled in a matter of hours—depending on the distance to your refinery.

24-HOUR SERVICE

Here are two examples of how a Du Pont "warehouse-on-wheels" has operated to the customer's advantage.

Due to a recent strike, one refiner was called on to step up his production schedule for a short period. But he didn't have the necessary "lead" on hand for such an accelerated program. So he put in a call to the nearest Du Pont Petroleum Chemicals Division district office!

With a loaded TEL tank car on a nearby siding, Du Pont was able to deliver his order to the refinery within 24 hours.

In another instance, TEL cars *en route* to the West Coast were held up by floods. The delay could have meant a serious loss of production time for the West Coast refineries. But the Torrance and El Monte sidings were able to deliver enough TEL to keep the refineries producing on schedule until the regular shipments arrived.

FULLY-STOCKED WAREHOUSES

In addition to the above mobile units handling tetraethyl lead, Du Pont also maintains three fully-stocked warehouses in Houston, Los Angeles, and Wilmington, Del., which carry a supply of all other Du Pont gasoline additives.

Automotive Technologist

JAY BRENT MALIN

A specialist in internal combustion engines, J. Brent Malin joined the Du Pont Company in 1951 as an automotive technologist.

Much of Malin's work consists of assisting oil companies in solving product application problems—particularly those pertaining to large fleet operations. In cooperation with automobile manufacturers, he also works on engine developments pertaining to fuel and lubricant applications . . . and keeps up-to-date on significant automotive trends.

Malin came to Du Pont from North American Aviation where he applied his knowledge of combustion characteristics to the development of rocket motors. Prior to this, he spent 10 years in engine research and development work at The Texas Company.

What's in a Name?

Your company's name is one of its most important assets. It stands for your reputation for producing dependable products, as well as for the company's personnel and material assets.

And since your brand name represents your company in competition, it is important that your dealers and customers use the name whenever they refer to your gasoline brand . . . and know the quality features that distinguish it from other brands.

When you encourage motorists to use your brand names rather than such vague terms as "regular" or "premium," you are encouraging them to distinguish between *your* brands and all other gasolines.

To help stimulate dealers to promote your brand names more aggressively—and the quality features for which they stand—Du Pont has developed a unique brand name presentation. It is suitable for showing at dealer meetings and can be highly individualized to point up the distinctive selling features of your own gasolines. It is available to all oil companies.

MOVIES AVAILABLE

Prints of the following Du Pont films are available to oil companies for training and public relations purposes. They may be borrowed or purchased. Address request to nearest Petroleum Chemicals Division district office.

Pipeline on Wheels—A 26-minute, full-color movie on tank truck safety. Suitable for both training and public relations purposes.

What Makes a Gasoline Good—An 18-minute cartoon movie in color. Presents the story of how high quality gasoline is made in easy-to-understand form. Ideal for dealer training meetings.

In addition to the above, Du Pont makes available a special library of films of particular interest to the petroleum industry.

DU PONT
REG. U.S. PAT. OFF.
Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

District Offices: New York, N. Y. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · Los Angeles, Calif.

District Laboratories: Wilmington, Del. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · El Monte, Calif.

IN CANADA: Canadian Industries Limited—Toronto, Ontario—Montreal, Quebec—Calgary, Alberta

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-3962

Printed in U. S. A.

YOU'LL FIND TRECO CATS FROM BORDER TO BORDER

- Hi-Way Refineries, Ltd., Saskatoon, Saskatchewan, Canada
- Farmers Union Central Exchange, Laurel, Montana
- Cooperative Refinery Association, Phillipsburg, Kansas
- National Cooperative Refinery Association, McPherson, Kansas
- Kanotex Refining Company, Arkansas City, Kansas
- El Dorado Refining Company, El Dorado, Kansas
- Midland Cooperative Wholesale, Cushing, Oklahoma
- Cosden Petroleum Corporation, Big Spring, Texas
- McMurrey Refining Company, Tyler, Texas
- Southwestern Oil and Refining Company, Corpus Christi, Texas

After only ten years in business, REFINERY ENGINEERING Company has built cat crackers from border to border—from Canada to Mexico and has seven under construction at this time.

If your company is considering a new cat cracker or other new refining facilities or the revamping of your old plant, it will pay you to confer with Treco at once. A call from you will be appreciated and will receive prompt, courteous attention.

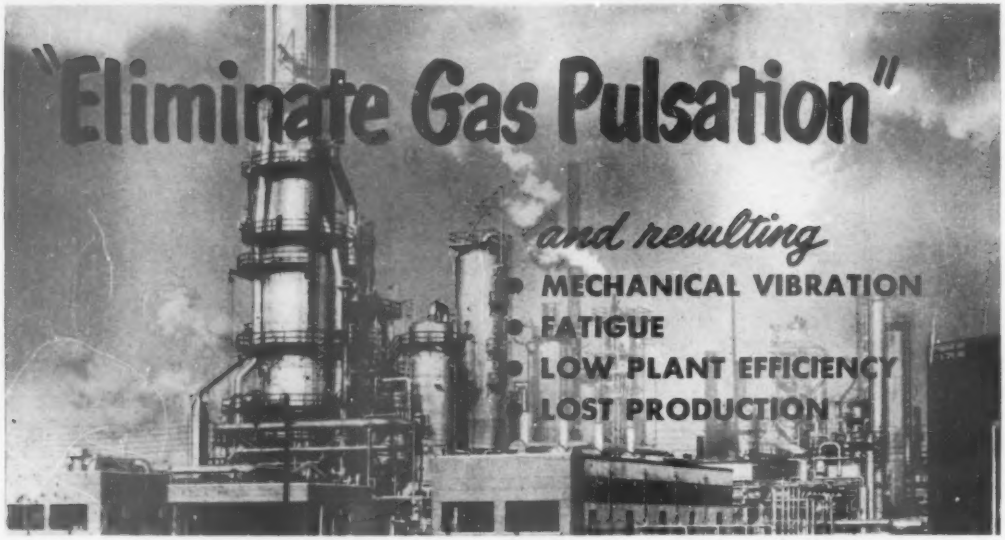
We have just produced a brochure telling the story of Treco and showing many of the jobs we have completed. A copy will be mailed you promptly if requested on your company letterhead.

TRECo

REFINERY ENGINEERING *Company*

PHONE 5-5561 • TULSA, OKLAHOMA

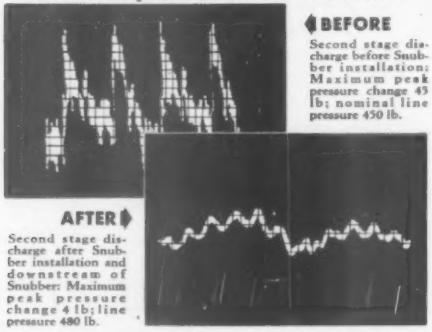
"Eliminate Gas Pulsation"



and resulting

- MECHANICAL VIBRATION
- FATIGUE
- LOW PLANT EFFICIENCY
- LOST PRODUCTION

Solution to a typical Surge Problem in a Compressor Line Installation



BEFORE

Second stage discharge before Snubber installation: Maximum peak pressure change 45 lb; nominal line pressure 450 lb.

AFTER

Second stage discharge after Snubber installation and downstream of Snubber: Maximum peak pressure change 4 lb; line pressure 480 lb.

Send for your copy of a typical Burgess-Manning Pulsation Survey and Analysis Report

BURGESS-MANNING PULSATION SURVEY

Burgess-Manning pulsation surveys are conducted by trained and fully experienced engineers with electronic equipment including pressure pickup (transducer), amplifier, and oscilloscope. The pressure transducer is coupled as close to the gas stream as possible and faithfully reproduces in voltage the pressure changes in the pipe. This voltage is conducted to a three stage amplifier and then to the oscilloscope screen. Photographs are taken of the screen as a record of surge. Data is taken and recorded. Maximum peak pressure change is calculated. Report is prepared. Recommendations are made that best solve your problems.

CONSULT BURGESS-MANNING ENGINEERS

Gas pulsation in compressor piping systems often results in excessive vibration and material fatigue. This, in turn, necessitates constant maintenance in piping and equipment resulting in lower over-all plant efficiency.

Your compressor system pulsation problem can be solved by Burgess-Manning Company engineers. This division maintains a field service to make surveys and analyses of flow conditions in pressure piping. Trained engineers correlate this data for reference in making Burgess-Manning Gas and Air Line Snubber recommendations for new plants as well as for existing plants.

Write for your copy of a typical case history in which Burgess-Manning engineers solved a tough problem.

Typical application showing Burgess-Manning Gas and Air Line Snubbers installed on discharge side of multiple-stage gas compressors.

Burgess-Manning Gas & Air Line Snubber.

BURGESS-MANNING COMPANY

1203 Dragon Street
DALLAS, TEXAS

Chicago, Illinois — Libertyville, Illinois

REPRESENTATIVES: Houston • Tulsa • Los Angeles • St. Louis • New York

-it's UNIBOLT, all welded!

A cycling plant operator in Oklahoma makes good use of UNIBOLT Adjustable Wing Valves, Tees, and Couplings in a 3000 lbs. w.p. multiple-well gathering manifold. One section of the gathering system is shown in the above photograph.

Note that all of the fittings are provisioned for butt or socket welding. The use of Unibolt Couplings facilitated shop fabrication and testing of each unit before assembly in the manifold. The elimination of flanged connections substantially reduced the bulk and weight of the manifold without sacrificing strength, to say nothing of the time saved. Any unit in the manifold may be easily dismantled by simply releasing the Unibolt Couplings. The Adjustable Wing Valves provide accurate and dependable control of the production from each well, or a pressure-tight shut-off if needed.

THORNHILL-CRAVER COMPANY

P. O. BOX 1184 HOUSTON, TEXAS

PARKERSBURG *Air Balanced* PUMPERS

The most efficient, economical, trouble-free method of pumping ever offered

Performance and cost records have proved the value of the advantages and features which are designed and built into Parkersburg Air Balanced Pumpers.

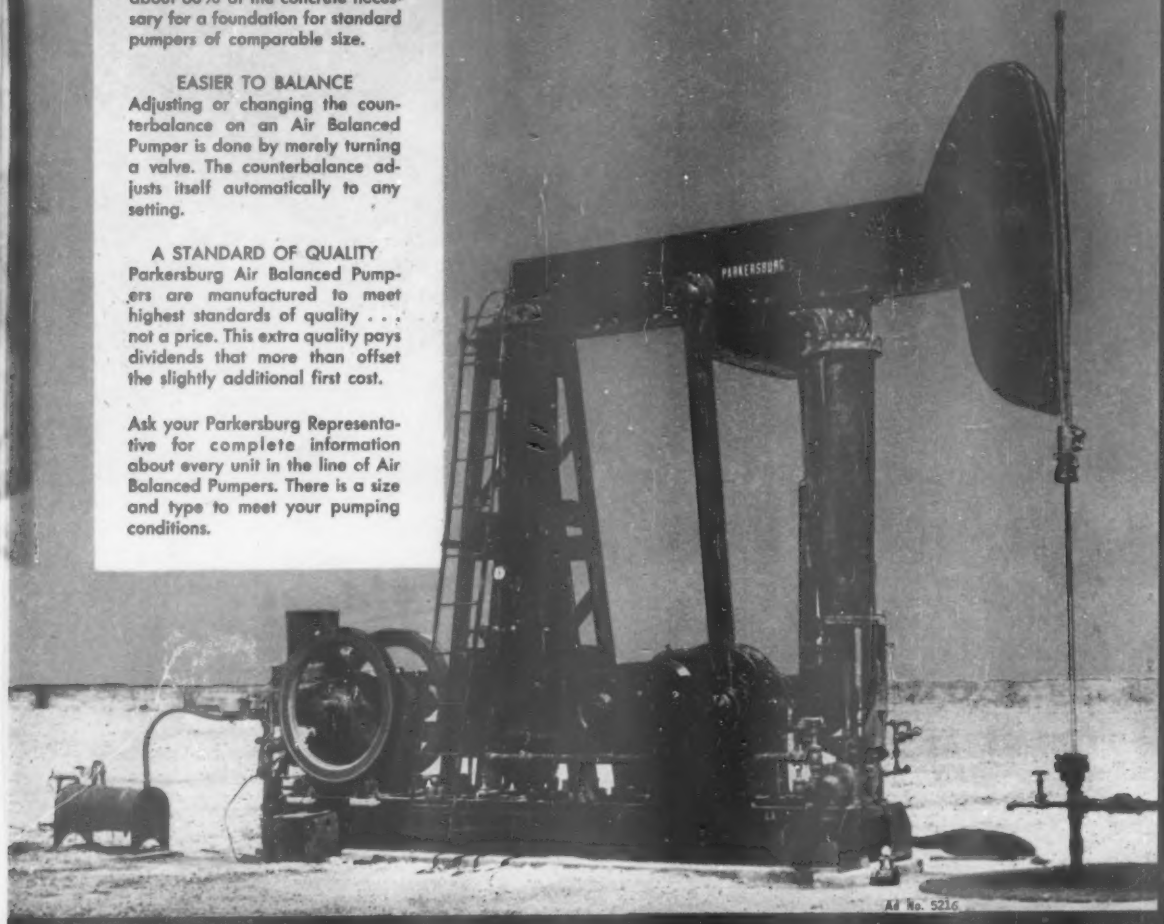
LOWER MAINTENANCE COSTS
Air Balanced Pumpers exert less wear and tear on rods and fluid pumps . . . develop less polish rod loads than standard crank and beam-weight counterbalance.

EASIER, LESS COSTLY TO INSTALL
Air Balanced Pumpers require only about 60% of the concrete necessary for a foundation for standard pumpers of comparable size.

EASIER TO BALANCE
Adjusting or changing the counterbalance on an Air Balanced Pumper is done by merely turning a valve. The counterbalance adjusts itself automatically to any setting.

A STANDARD OF QUALITY
Parkersburg Air Balanced Pumpers are manufactured to meet highest standards of quality . . . not a price. This extra quality pays dividends that more than offset the slightly additional first cost.

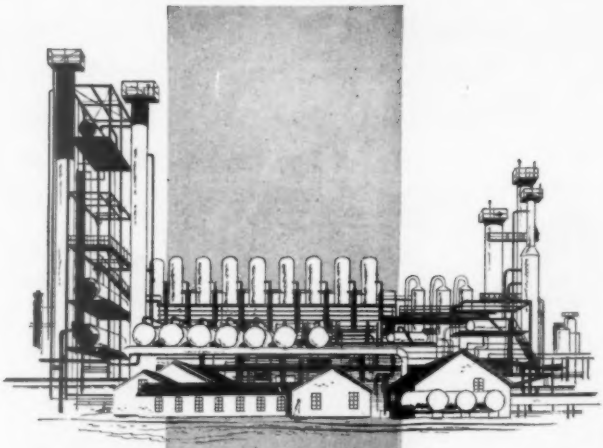
Ask your Parkersburg Representative for complete information about every unit in the line of Air Balanced Pumpers. There is a size and type to meet your pumping conditions.



Ad No. 5216

PARKERSBURG
PUMPERS *Air Balanced • Chain Driven • Gear Driven*

Manufactured in Coffeyville, Kansas



MORE BASIC CHEMICALS FROM MATHIESON . . .

CAUSTIC SODA

Basic alkali of petroleum refining, caustic soda is but one of the essential raw materials manufactured for the petroleum industry by Mathieson. Today, from a widely diversified production, Mathieson enables refiners to secure *more* basic chemicals from *one* dependable source...such chemicals as:

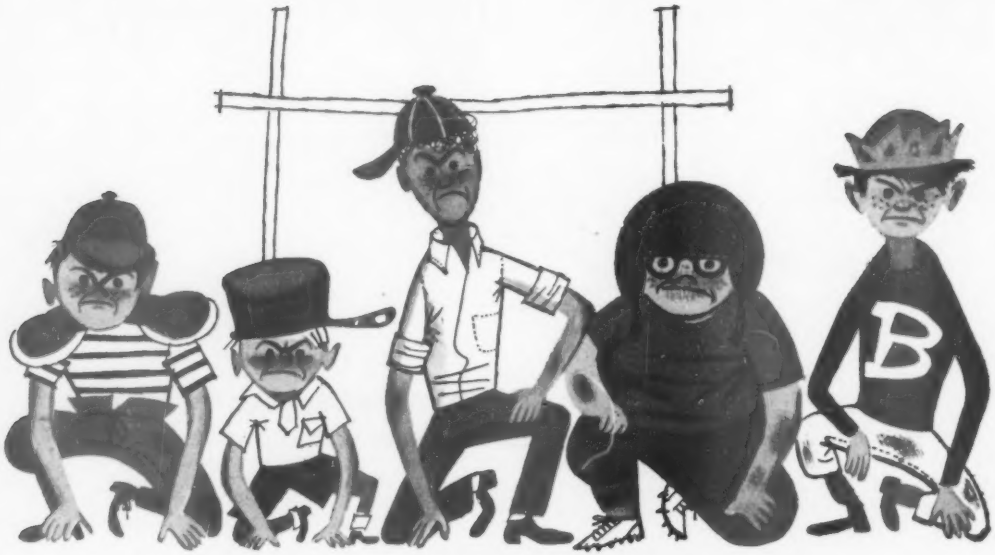
Caustic Soda	Ammonia
Soda Ash	Liquid Chlorine
Sulphuric Acid	Bicarbonate of Soda
Sodium Chlorite	Processed Sulphur
Triethylene Glycol	Diethylene Glycol
Calcium Hypochlorite	Dichloroethylether

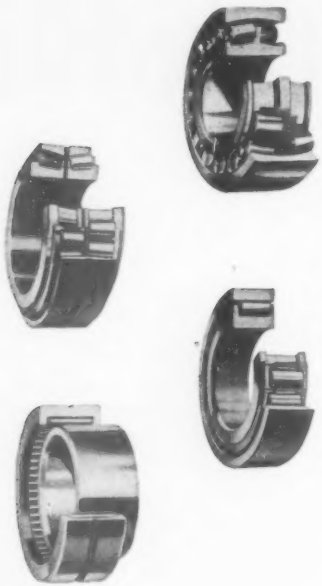
Under current market conditions, a dependable source of supply is especially important. You may be able to buy *to better advantage* by consulting with us now. Mathieson Chemical Corporation, Baltimore 3, Maryland.

Mathieson
CHEMICALS

9903

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH





all types . . .

Many builders and users of mechanical equipment have found the answer to their anti-friction bearing needs at Torrington which makes all basic types.

Torrington spherical roller, tapered roller, straight roller, needle and ball bearings are available in a wide variety of sizes. And when a standard type "won't do", Torrington designs special bearings tailored to the job.

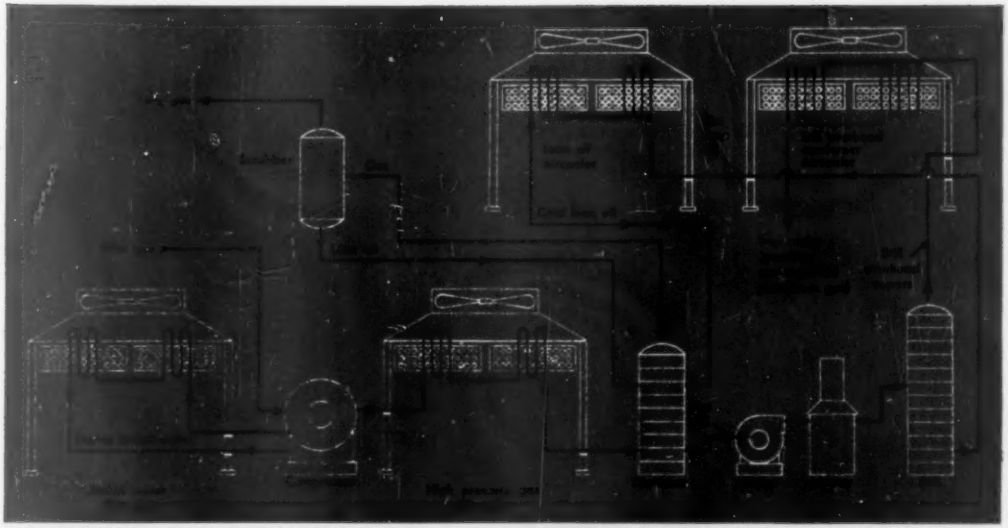
So whether you need an unbiased recommendation for the standard bearing best suited to your application or a special bearing, Torrington is always ready to serve you. Call the office nearest you.

THE TORRINGTON COMPANY
Torrington, Conn. South Bend 21, Ind.
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON BEARINGS

Spherical Roller • Tapered Roller • Straight Roller • Needle • Ball • Needle Rollers

- **cooling engine jacket water**
- **cooling high pressure gas**
- **condensing overhead vapors**
- **cooling lean oil**



versatile ALCO AIRCOOLERS handle all these cooling duties at natural gasoline plants

ALCO Aircoolers demonstrate their versatility in natural gasoline plants. The simplified flow diagram above shows how Aircoolers are used to cool jacket water, cool high pressure gas, condense overhead vapors and cool lean oil.

The flexibility of ALCO fabricated steel header design also permits handling a number of different fluid streams in one tube bundle. For example, in some installations a single Aircooler may perform both the lean oil cooling and overhead vapor cooling functions.

ALCO Aircoolers are the logical and economical solution to all types of cooling problems where abundant good water is not available. Scale and corrosion troubles are eliminated.

For details call your nearest ALCO Sales Engineer at Beaumont, Chicago, Dunkirk, Houston, Los Angeles, New York or Tulsa.

Send Coupon for ALCO Aircooler Bulletin.

ALCO

ALCO PRODUCTS DIVISION
AMERICAN LOCOMOTIVE COMPANY
Plants: Dunkirk, N. Y. • Beaumont, Texas

***In step with tomorrow*— ALCO AIRCOOLERS, Heat Exchangers, Evaporators, Feedwater Heaters, Pressure Vessels, Pipe**

ALCO PRODUCTS DIVISION
AMERICAN LOCOMOTIVE COMPANY
Schenectady, N. Y.

Gentlemen:
Please send me the ALCO Aircooler Bulletin.

Name..... Position.....

Company.....

Address.....

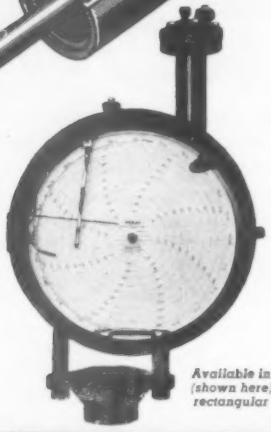
City..... Zone..... State.....

You've never seen a meter bearing as trouble-free!

...has lowest torque under pressures to 5000 p.s.i.
..."Life-Lubricated" at the factory

This exclusive stainless steel Pressure-Seal Bearing is virtually frictionless, free from maintenance and leaks. O-Ring seals of a resilient, chemically inert material are retained in a unique mounting which assures minimum torque even under high static pressure. No metal-to-metal contact. No adjustments . . . no periodic lubricating. Bearing shaft provides direct mechanical connection between float and pen . . . no lost motion . . . higher sustained accuracy. Shafts are interchangeable . . . can be replaced if damaged.

Be sure to check all the advantages that contribute to the greater accuracy of the new Foxboro Flow Meters. Write for Bulletin 460. **The Foxboro Company, 609 Neponset Avenue, Foxboro, Massachusetts.**



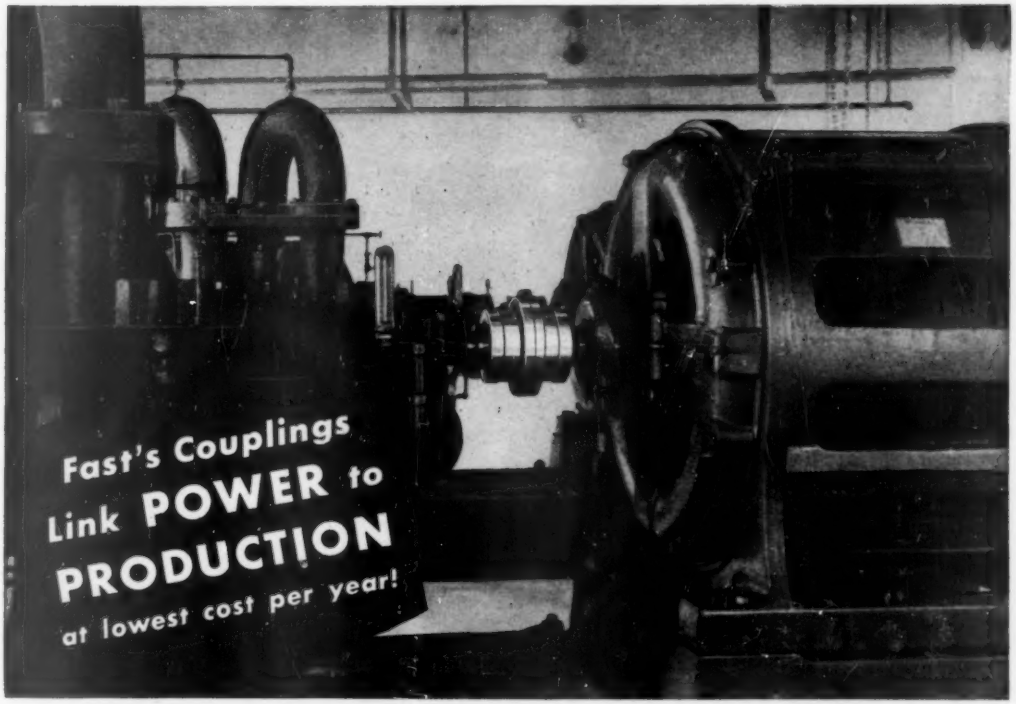
Available in round (shown here) and rectangular cases.

OTHER NEW BASIC ADVANCES

- **Precision Float Assembly** with stainless steel ball chain and collet-type clamp insures slip-proof, friction-free transmission of float motion to the recording pen.
- **Sure-Seal Check Floats** insure perfect seating; submerged in mercury to prevent frosting and fouling.
- **Union-coupled U-bend** eliminates gaskets; always lines up.
- **Calibrated Damping Plug** fully adjustable under pressure.

FOXBORO REG. U.S. PAT. OFF. **... First in FLOW METERS**

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND



FAST'S Couplings usually outlast the equipment they connect!

ACTUAL cases on record show many Fast's Couplings are still in service after as much as 30 years of continuous operation! Time and time again, equipment has been replaced while the original Fast's Couplings remained on the job.

To you, these records of dependable, trouble-free service mean freedom from costly coupling failures when you specify Fast's. And they mean Fast's cost you far less to own and operate . . . because their cost can be amortized over long years of dependable performance.

For full details on how Fast's Couplings and Koppers Engineering Service can help you, write today for a free copy of our catalog to: KOPPERS COMPANY, INC., *Fast's Coupling Dept.*, 289 Scott St., Baltimore 3, Maryland.

Here's How FAST'S Save You Money

Free Service—Koppers free engineering service assures you the right coupling for the job.

Rugged Construction—Fast's still maintains its original design, without basic change or sacrifice in size or materials. Result: freedom from expensive coupling failures.

Lowest Cost per Year—Fast's Couplings usually outlast equipment they connect. Their cost may be spread over many years!

KOPPERS

FAST'S
THE ORIGINAL
GEAR-TYPE
Couplings

INDUSTRY'S STANDARD FOR 32 YEARS

KOPPERS COMPANY, INC., *Fast's Coupling Dept.*,
289 Scott St., Baltimore 3, Md.

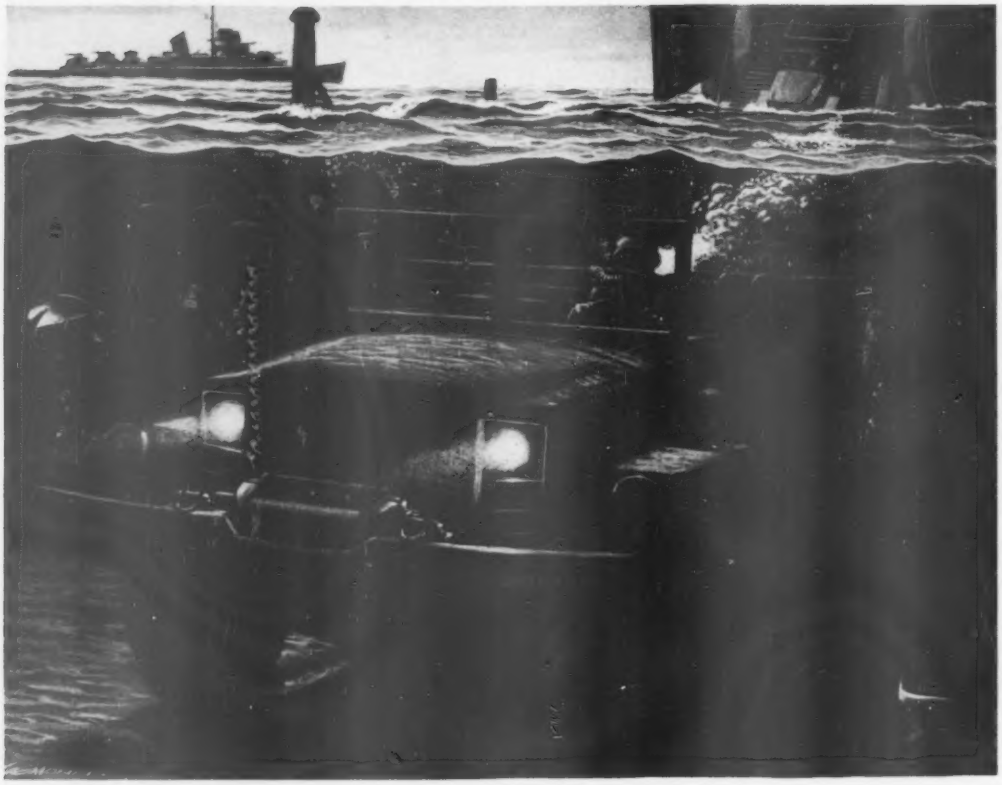
Gentlemen: Send me Fast's Catalog which gives detailed descriptions, engineering drawings, capacity tables and photographs.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____



Sea-Going Truck!

1. **Two fathoms under,** this truck can roll along the ocean bottom for several hours, stopping, starting, idling at will. In surf or shallow rivers, driver can submerge truck as much as seven feet and steer with his head above water, or he can don breathing mask for greater depths. Truck's breathing devices, extending above water, consist of "snorkel" for air intake and "snorter" for exhaust.

2. **Called "Eager Beaver"** because it's as much at home under water as on land, the truck was designed to improve Army transportation. To improve *your* transportation, petroleum engineers have developed spectacular Conoco Super Motor Oil, the amazing lubricant that helps make engines last longer . . . perform better.

3. **50,000 Miles—No Wear!** After a punishing 50,000-mile road test, *with proper drains and regular care,* engines lubricated with Conoco Super Motor Oil showed *no wear of any consequence:* in fact, an average of less than one one-thousandth inch on cylinders and crankshafts. Gasoline mileage for the *last* 5,000 miles was actually 99.77% as good as for the *first* 5,000. Proof that Conoco Super, with OIL-PLATING, *can* keep new cars new!

Now in its 77th year, Continental Oil Company is a leader in oil research and a pioneer in oil-perfecting additives, with more than 100 patents on discoveries that improve performance and lengthen the life of your car.

©1952 **CONTINENTAL OIL COMPANY**

Here is a magneto that controls explosive fumes with "flame-proof" ventilation. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low tension voltage to the high tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- **Low Plug Erosion Rate**
- **Breaker Type Distributor**
- **Ventilation without Fire Hazard**
- **Radio Shielding Available**
- **Variable or Fixed Ignition**

Bendix

SCINTILLA MAGNETO DIVISION OF
SIDNEY, NEW YORK

Bendix
AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

FACTORY BRANCH OFFICES:
117 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan
Brouwer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

GET

"PIN POINT CONTROL"

WITH

HANCOCK

FLOCONTROL VALVES

Say "good-bye forever" to filed notches, paint daubs, string tying and other make-shift ways of marking globe valve settings. With Hancock Flocontrol Valves in your lines, you can be sure of "pin point control" of flow, temperature or pressure. The sturdy micrometer dial and pointer attached to the bonnet permits settings to within a 1/100th turn of the handwheel! And, you can instantly duplicate any setting exactly, any time.

Hancock Flocontrol Valves are available in bronze and steel. Both types are strong, leak-defying valves with scientifically designed V-Port disc that *compels proportional flow throughout the entire lift of the valve stem.* The shut-off seating surface is entirely separate from the control V-port disc. The seats and discs are superfinished "500 Brinell" stainless steel. Foreign substances or steam cutting effects are minimized.

Eliminate guesswork. Minimize repairs and maintenance. Install the most efficient and economical valves you can use—Hancock Flocontrol Valves. Get in touch with your nearby Hancock Distributor for complete information.

HANCOCK BRONZE FLOCONTROL VALVES: Types: Globe and Angle. Sizes: ⅛" through 2". Screwed Ends. Available in 150# and 300# Series.

HANCOCK 600# STEEL FLOCONTROL WELDVALVES: Types: Globe and Angle. Outside Screw and Yoke. Sizes: ¼" through 4" Screwed, Socket Welding and Flanged Ends. Available with 150#, 300# and 600# Series Flanges.

V-PORT DISC is scientifically designed. Shut-off seating surface is entirely removed and separate from the controlling V-Ports. Wire-drawing and cutting action are minimized. No separate shut-off valve needed. Hancock Flocontrol Valves are "2 in 1" valves. The separate seating surface on the V-Port disc gives you a shut-off valve as well as a control valve.

1877 HANCOCK U.S.A.

MAXWELL MANNING & MOORE INC. TRADE MARK

When Hancocks go in, valve costs go down

HANCOCK VALVES

A product of MANNING, MAXWELL & MOORE, INC. WATERTOWN 72, MASSACHUSETTS

MAKERS OF 'HANCOCK' VALVES, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

"We get better "mileage" with PITT CHEM Enamels!"

DOPE MEN know that it takes an enamel with top application characteristics to keep their machines eating up the miles at top speed. And that's one big reason why they prefer Pitt Chem. They've learned from experience that Pitt Chem Enamels heat up faster, flow better from kettle to pipe, and coat more pipe per ton because of their consistent peak quality and uniform bond. What's more, Pitt Chem's consistently better bond means *better, longer-lasting protection* underground.

We're able to offer these advantages because of Pittsburgh Coke & Chemical's *basic* and *integrated* production facilities. Our careful and exacting quality-control extends from coal, through each step of production, to the finished enamels. So when you're specifying pipe-line enamels, *buy basic—buy Pittsburgh*—and be sure of better protection at lower cost.

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- ★ Plasticized Grade Tar Base Enamel
- ★ Cold Applied Tar Base Coatings

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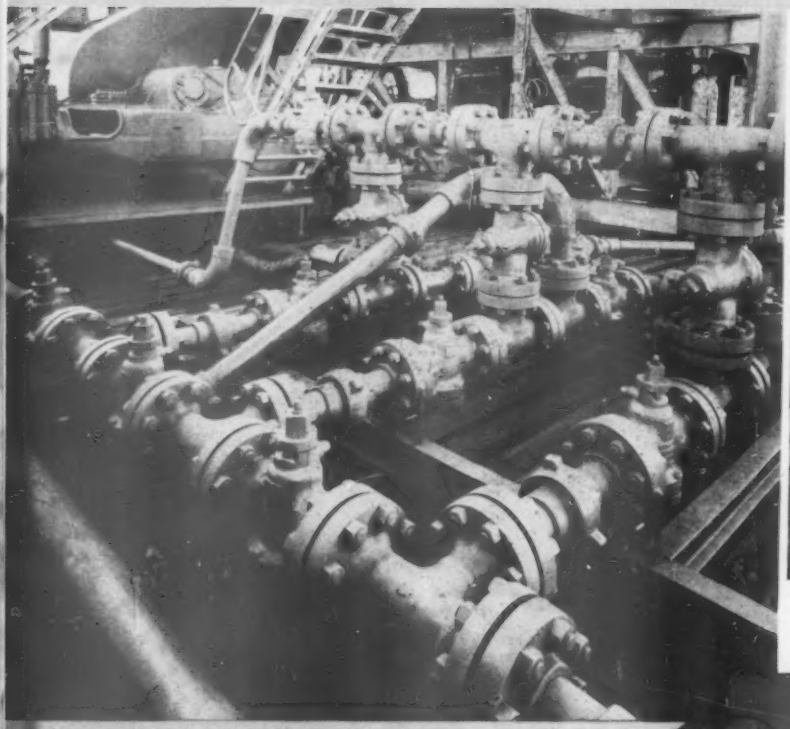
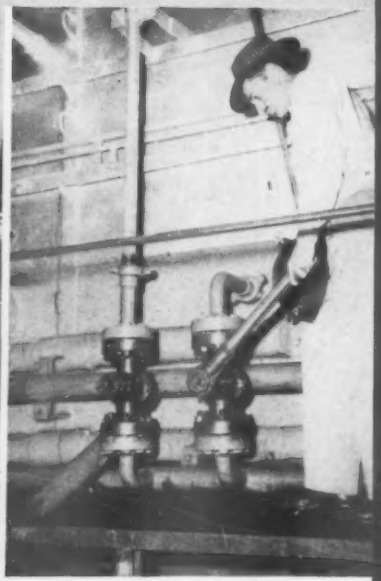
ALL OVER THE RIG—
NORDSTROM MUD LINE VALVES

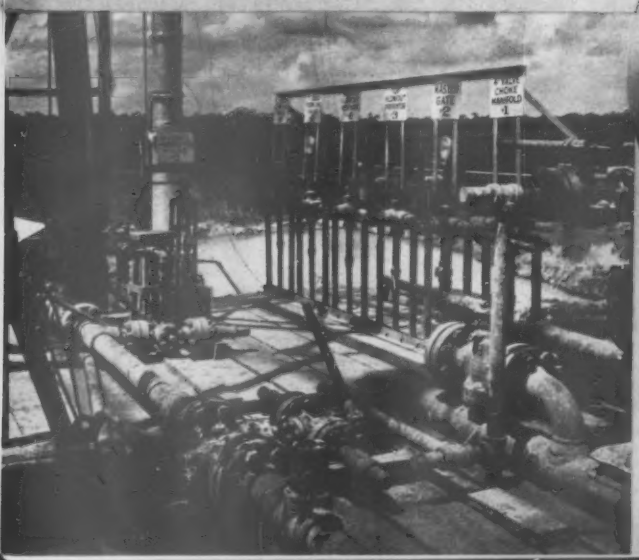


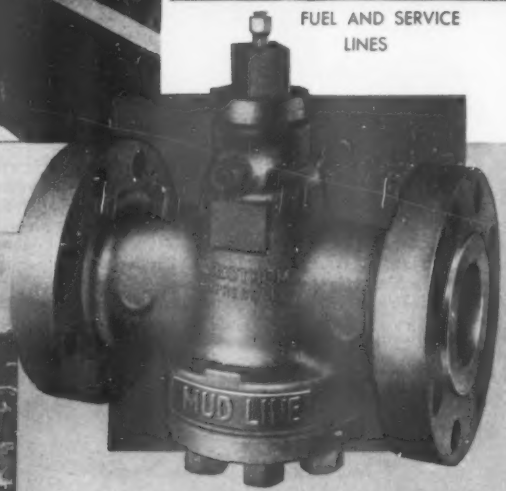
MUD LINE MANIFOLDS

BLOW-OUT PREVENTER MANIFOLDS AND SERVICE LINES



FUEL AND SERVICE LINES





Wherever you are in the oil fields, there's a supply house nearby with Nordstrom valves and Nordstrom service.

ALL OVER THE WORLD
HELP SET DRILLING RECORDS

Nordstrom Merchrome-coated Hypreseal valves have been in on most of the record-setting drilling operations of the last two decades. Time after time, when new depth marks were recorded, the rig was Nordstrom equipped.

There's no better mudline valve than Nordstrom. It's dependable—it's versatile. It's built in types, sizes and pressures for nearly every line on every rig . . . mud lines, pump lines, gas and water service lines, blow-out preventers, standpipes and manifolds of all kinds.

While helping set drilling records, Nordstrom Merchrome-coated Hypreseal valves have been setting records of their own —for low maintenance and long life. Many have been disassembled after from 100,000 to 200,000 feet of drilling, only to be re-assembled without repair and put back into service for many more feet of trouble free operation.

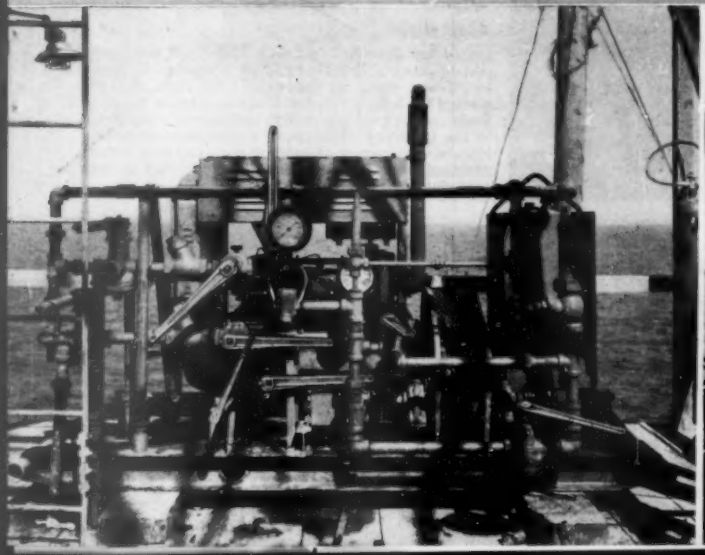
There's a reason, of course—

Nordstrom Mud Line Valves are armored against erosion and the destructive effect of drilling mud with its erosive chemicals and high temperatures and pressures. Merchrome hard facing, welded over the entire contact surface of body and plug, combined with straight-through flow and unexposed seats means longest valve life.

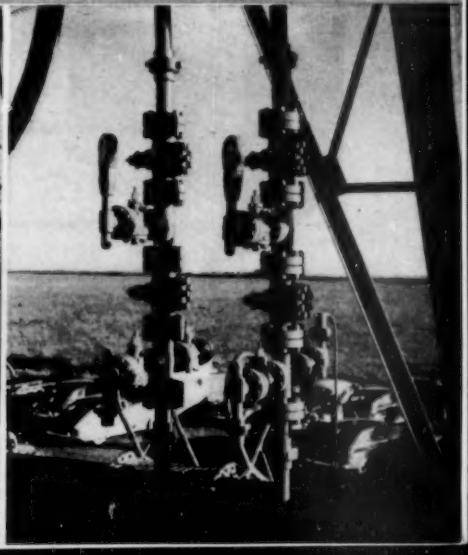
Nordstrom Hypreseal valves are built to withstand pressures up to 5000 lb WOG in mud line service. Write for Bulletin V-208 describing Nordstrom Mud Line Valves. Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 8, Pa.

Rockwell Built
Another Product
Nordstrom Valves
LUBRICANT SEALED TO KEEP UPKEEP DOWN

BLOW-OUT PREVENTER MANIFOLD

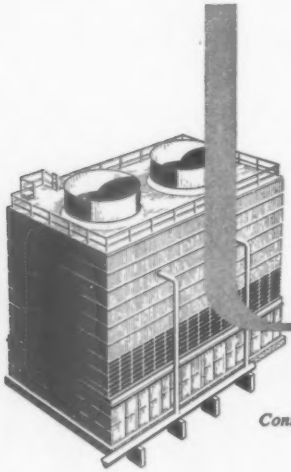


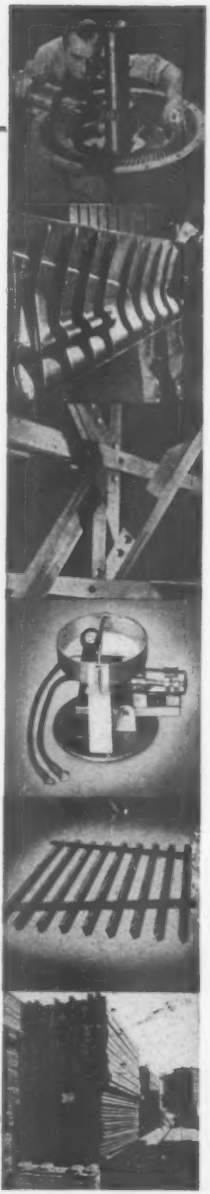
STANDPIPES



ONLY FLUOR

induced draft counterflo cooling towers provide these 6 exclusive features...





Spiral Bevel Gear Speed Reducers

Only Fluor-Western speed reducers incorporate curved tooth spiral bevel gears as standard design. This proven principle provides quieter, smoother, more efficient operation under the rugged conditions of cooling tower service. Other special design features include: oil-bath lubrication; dry air breather; chrome-plated shaft at oil seals; and, low-speed fan shaft mounted on special steep angle thrust and radial bearings to take combined gear thrust, fan thrust, and weight of fan assembly.

Unique Fan Blade Design

The Fluor Type HC Stainless Steel Fan blades, furnished as standard on every Fluor Counterflo Cooling Tower, are a joint development of The Fluor Corporation and Solar Aircraft Company. Designed specifically for induced draft cooling tower service, their unique air foil handles maximum air volumes at minimum tip speeds and horsepower requirements. Design *plus* mechanical arrangement eliminates recirculation of air and resulting power-consuming turbulence.

Internal Gusset Plate Construction

Fluor Counterflo Cooling Towers alone make full use of tensile as well as compressive strength of structural members! Their internal gusset plate design duplicates that used in wooden bridge construction. These simple, yet extremely strong joint connectors mean longer tower life, lower total tower weight, fewer and simpler castings, greater ease of erection, and minimum spoilage should the structure be dismantled, moved and re-erected.

Patented Vibration Cut-Out Switch

The Vibration Cut-Out Switch developed and patented by Fluor in 1944 protects tower structure and mechanical equipment by stopping the motor should excessive vibration suddenly occur. In addition to its value as an emergency safety device, the switch can be utilized by the operator as a positive "on-off" switch during routine inspection of tower structure and mechanical equipment. The motor cannot be started accidentally once the switch is placed in the "off" position.

Sloping-Bar Grid Decking

Exclusive Fluor-designed sloping-bar grid decks are of rough-finished 1" select redwood machine-nailed to 1" x 2" cleats—strong enough for use as scaffolding during erection, rugged enough to withstand the erosion of falling water. This means low maintenance and replacement cost. The sloping-bar design and arrangement of each deck cross member combines the advantages of maximum deck surface with minimum air pressure drop through tower.

Complete Prefabrication of Structure

Only Fluor Counterflo Cooling Towers are completely prefabricated. This offers many advantages to the operator. Tower parts are "packaged" for rapid delivery, marked for orderly erection. Erection is faster, easier, at lower cost. All cutting, drilling and nailing is completed at the factory. Prefabrication means standardization—low-cost replacement of standard parts that may become damaged over the years. It means uniformity in both performance and appearance.

Contact your nearest Fluor representative for detailed information. You Can Be Sure With Fluor

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THE OLD DUTCHMEN SAID:

„Spreken is zilver en zwijgen is goud!"

(SPEAKING IS SILVER AND SILENCE IS GOLD)

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WHY OPERATORS PREFER SCHLUMBERGER!

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Jospin

IT Takes Planning

TO GET PRODUCTION

. . . Teamwork among land men, seismograph crews and drilling contractors. To make production "pay off" you need pipeline companies, refiners and marketers. As every independent or major company knows, a first essential is adequate financing by a staff who understand your business and speak your language. We have such a team in our Oil and Gas Department . . . an experienced staff interested in helping you get maximum return from your investment. Come in and see us, soon.

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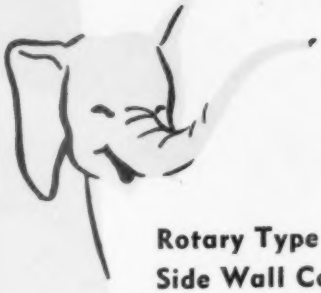
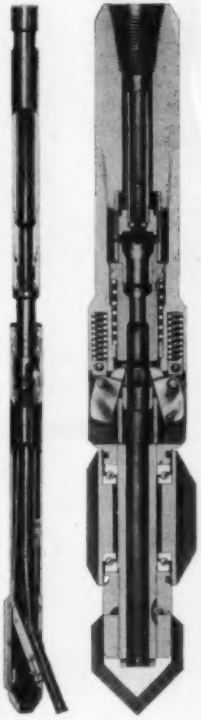
America's two leading candidates Picked as the most valuable tools In the Oil Industry



Rotary Type Side Wall Core Barrel

PLATFORM

Lubricated cores cut by rotation.
Cores averaging 5.8" long x 1¼" diameter.
Un-compressed and Un-contaminated cores.
Completely safe operation.



Autoflex-Eccentric Guide Casing Mill

PLATFORM

Mills 263% faster than conventional mills.
Improved knives for more cutting power.
Each knife spring-loaded for continuous cutting.
Guide causes knives to saw for full use and quicker milling.

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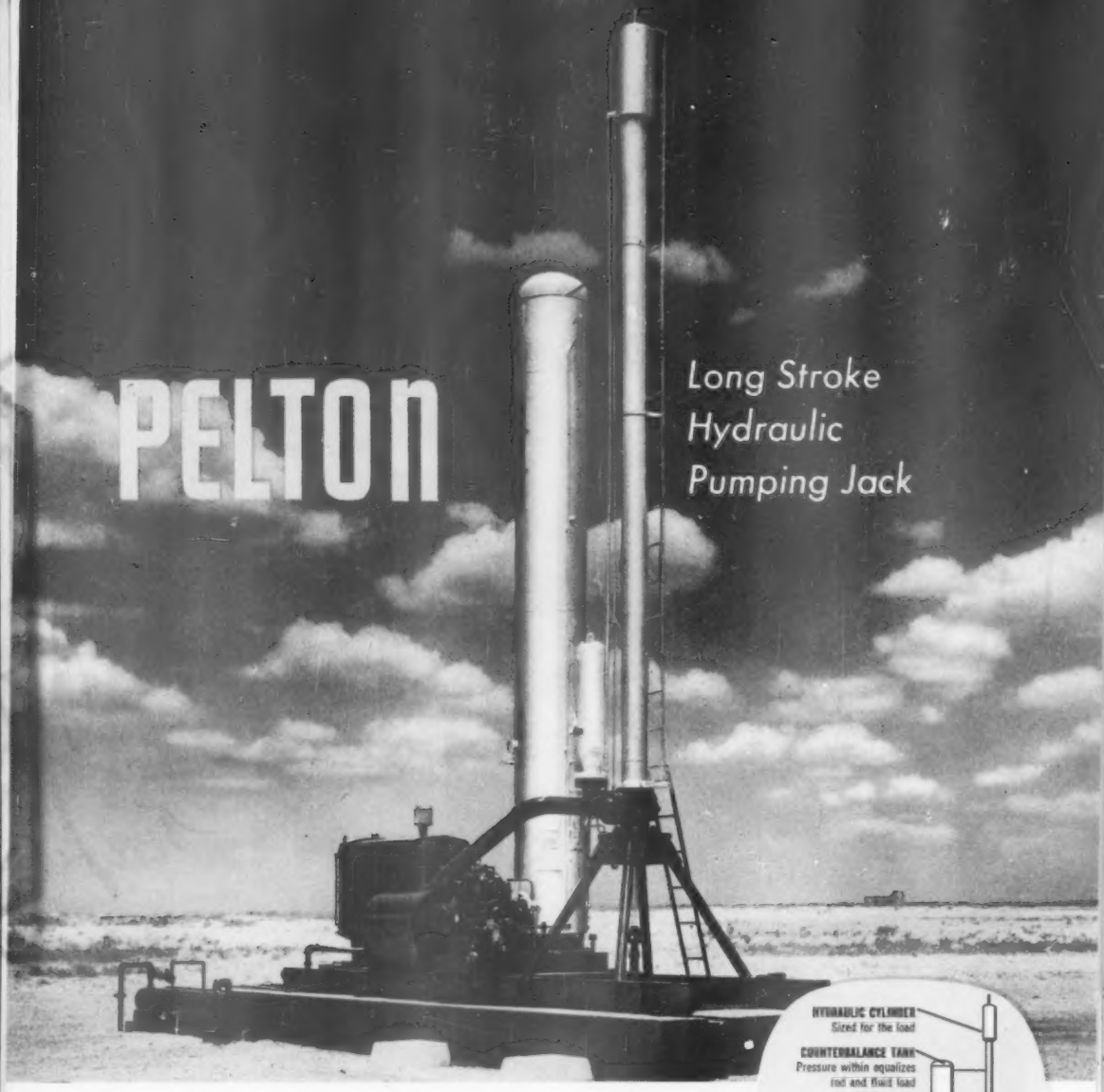
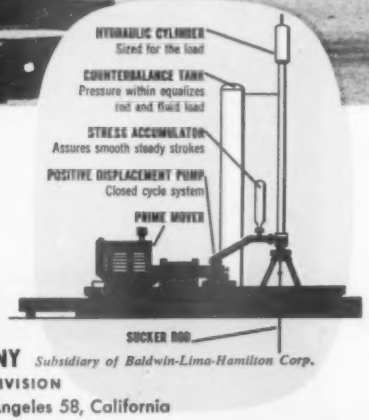
PELTON

Long Stroke Hydraulic Pumping Jack





Here in a West Texas field is a typical installation of a PELTON Long Stroke Hydraulic Pumping Jack. This is the most modern, most efficient surface pumping unit ever devised for the sucker rod pumping of oil wells. With PELTON, each well may be pumped to its maximum potential and lifting costs reduced to the absolute minimum.

Hundreds of PELTON installations in Mid-continent and California fields have proved Long Stroke Hydraulic Pumping the most satisfactory method for pumping the deeper wells and the shallow wells with heavy production.

PELTON Jacks are available in seven models with polished rod load ratings from 20,000 to 40,000 lbs. Stroke lengths 10, 20 and 30 ft. The complete story on this modern and successful method of pumping is contained in PELTON's new catalog.

PELTON WATER WHEEL COMPANY *Subsidiary of Baldwin-Lima-Hamilton Corp.*
OIL INDUSTRY MACHINERY DIVISION
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50th ANNIVERSARY
1902 1952
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ELECTRUNITE TUBING

And you'd scarcely believe the improvements we've made in welded steel tubing since 1902.

Over 30 years ago, the famous ELECTRUNITE process of electric welding replaced the old-fashioned brazed and gas-welded methods. Today, every foot of length, every inch of circumference in an ELECTRUNITE tubular product is equally strong, equally resistant to corrosion, equally smooth and round.

We've improved techniques and added many products to the ELECTRUNITE line, too. At right you'll see examples of all the products we make at our big, modern plants in Cleveland and Elyria, Ohio, Brooklyn, New York, and Ferndale, Michigan.

ELECTRUNITE tubular steel products help many industries make things stronger . . . or lighter to move . . . or attractive longer . . . or safer . . . and at lower cost.

These first 50 years are only a start on new and wonderful developments in ELECTRUNITE Stainless and Carbon Tubing for mechanical and pressure applications," Inch-Marked®" E.M.T. and Conduit for electrical installations.

The ELECTRUNITE Line

"Inch-Marked" E.M.T... Electrical Metallic Tubing . . . light, strong steel tubing raceway to protect electrical wires against fire, moisture, and impact.

Mechanical Carbon Steel Tubing... made in a wide range of grades, sizes, and wall thicknesses to make all types of products lighter, stronger.

"Dekoron-Coated" E.M.T. for complete, longer-lived protection of wires in highly corrosive atmospheres.

Stainless Steel Tubing and Pipe in a full range of sizes, types and wall thicknesses for chemical and food processing equipment, and mechanical applications.

Rigid Conduit . . . heavy-wall steel protection for wires in explosive and hazardous locations.

Heat Exchanger Tubes, both carbon and stainless steel, for all types of heat exchangers, condensers, process equipment, and heaters.

Boiler Tubes for large boilers or small, high pressures or low.

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REPUBLIC STEEL

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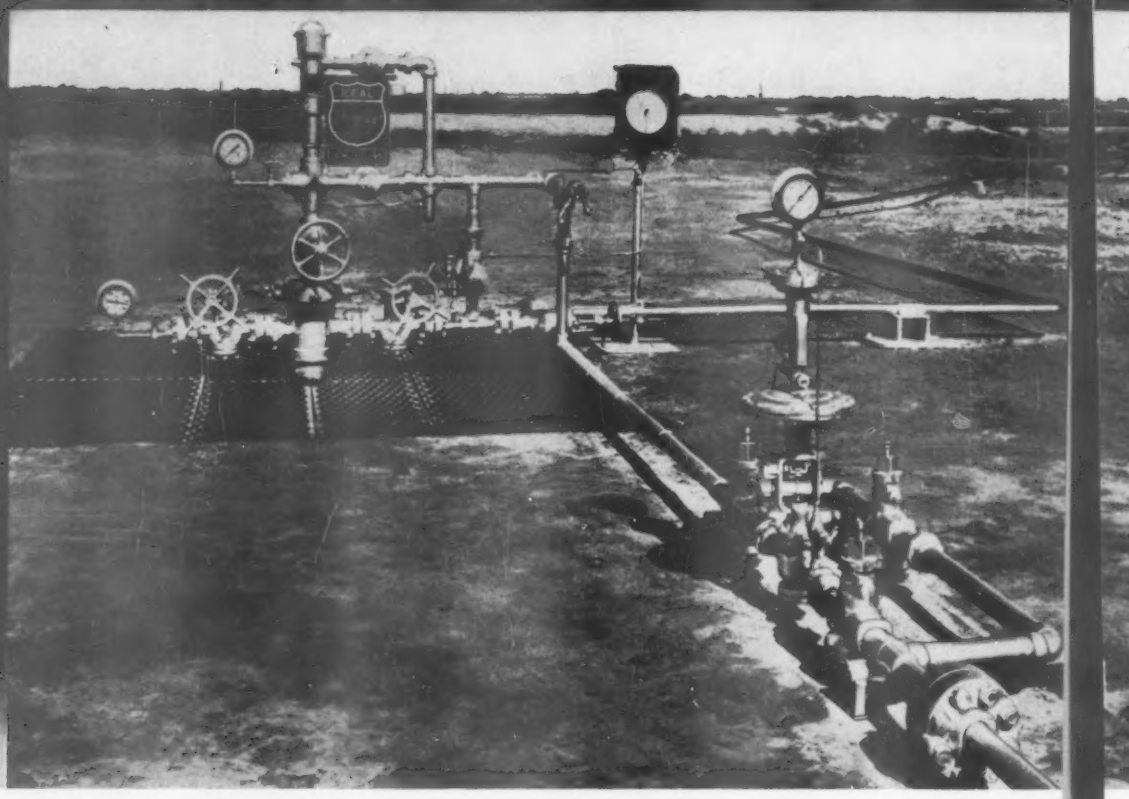
ELECTRUNITE
BOILER, CONDENSER AND HEAT EXCHANGER TUBES



Increase FLUID RECOVERY *deplete wells* ECONOMICALLY

with

IDEAL PLUNGER LIFTS

Production by Ideal Plunger Lift offers many opportunities for maximum ultimate recovery from

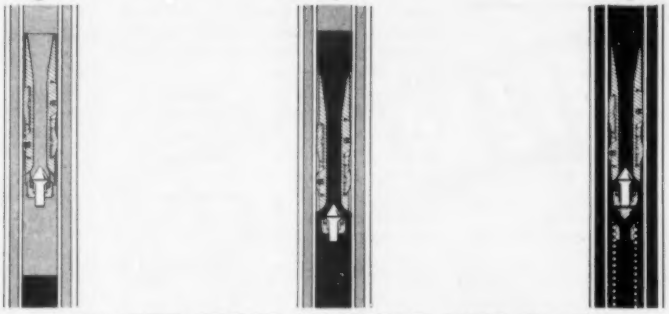
- Weak flowing wells in tight formations regardless of depth
- Wells with high bottom-hole pressures and low productivity indices
- Wells with high gas-oil ratios
- Wells in fields where pressured gas is available from any source

The low initial cost of the Ideal Plunger Lift, its long service life and economical operation, are important factors in effective depletion of many wells which could not be readily produced by other methods.

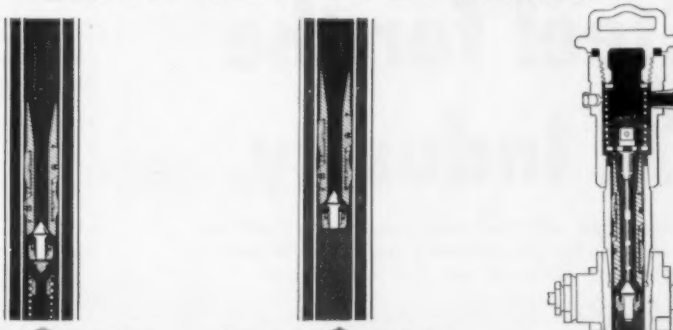
The Plunger, with valve held open by the magnet, falls by the force of gravity, first traveling through the gas in the upper portion of the tubing.

Then falls through the fluid which has entered the tubing around the Foot-Piece.

The Plunger is stopped when it strikes the spring-mounted Foot-Piece. The valve in the Plunger is closed under this impact, thus forming a solid free piston which is now ready to lift the column of fluid to the surface.

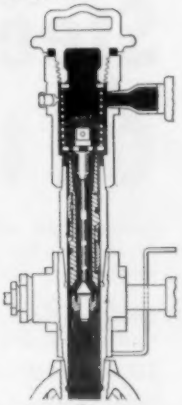


HOW THE IDEAL PLUNGER LIFT WORKS



Pressure from formation gas or injected gas builds up inside of the casing and below the Plunger.

When the casing pressure reaches the set-point of the Cycle Controller, the flow line Motor Valve at the surface is automatically opened, releasing the pressure on the tubing and allowing the Plunger to travel upward through the tubing with its load of fluid.



As the Plunger enters the Stack Assembly in the Christmas Tree it first makes contact with a cam pilot valve, actuating the Motor Valve which closes the flow line. The Plunger continues upward over the mechanical opener which unseats the Plunger valve. With the valve open, the Plunger again becomes a free-falling cylinder which travels down by gravity for another round-trip.

KEY: GAS ● **OIL** ● **GAS UNDER PRESSURE** ●

In addition the Ideal Plunger Lift helps overcome some producing problems by

- Preventing and removing paraffin
- Reducing emulsion to a minimum
- Preventing bottom-hole water accumulations
- Reducing scale deposits

An *advisory service* on Ideal Plunger Lift production methods has been established to provide you with complete information. Write for details.

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NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

They Say—

No Federal Oil Bureau, Please

"The chamber opposes all proposals for control by a federal bureau of production, end use, or price of petroleum and natural gas and is against all efforts, legislative or otherwise, to break the petroleum industry into separate parts, such as production, refining, transportation, and marketing.

"Experience has demonstrated that state laws and regulations providing the necessary incentives and proper conservation practices, together with close-at-hand state administration, encourage the risk-taking vital to the discovery and development of petroleum resources, a matter essential to the military security and economic well-being of the nation.

"On the other hand, federal laws and regulations with final authority remote from the scene of operations have tended to retard and discourage exploration for oil underlying federal lands. The chamber is, therefore, in opposition to all proposals for federal acquisition or control of known or potential oil-producing areas which are now administered by the several states."

Policy Declaration on Natural Resources, United States Chamber of Commerce.

First L.P.G. Salt Cavity

Sir:

We have read with interest your article "L.P.G. Goes Underground for Summer" in the July 28 issue of The Oil and Gas Journal. We note that in this article you state that the first cavity washed out in a salt bed was at Kermit, Tex., in 1950.

We want to advise that the Drillers Gas Co. washed out a storage for L.P.G. in salt near Elmer, Kans., in July 1949. The project was completed and filled with propane in August 1949. We believe that this is the first such propane storage ever created or made as the project was intentionally started and developed in salt beds for the purpose of storing liquefied petroleum gas.

We are sure that you would like to have your readers have the correct information.

L. B. Stewart,
Drillers Gas Co.,
Wichita, Kans.

Price Lid Still Tight

"Regardless of continued efforts by crude-oil producers to secure favorable action by the Office of Price Stabilization, there has been no definite accomplishment. . . .

"This stalemate is causing severe financial hardship, since producers are constantly experiencing increased costs for both operating and capital items.

"Crude-oil markets have now been frozen for more than 26 months at inequitable price ceilings that have pegged crude-oil market prices at much lower levels than prices and wages in general. These low price ceilings have generally restricted drilling and development and have caused producers to abandon an excessive number of wells, which items account for the continued decline in the over-all production of Pennsylvania Grade crude oil."

George J. Hanks, president, in the semiannual financial report of South Penn Oil Co.

Big-Business Controls for Labor?

"Some labor organizations are passing through the same phase of development that some industrial organizations experienced in the closing years of the last century.

"They are becoming too big and powerful for their own good. As a result of their bigness, they are forfeit-

Steel for the Oil Industry

Contact us for your steel requirements and extend Defense Order Ratings where they apply. Despite current shortages we will do our very best to supply you.

BARS—carbon & alloy, hot rolled & cold finished, heat treated, etc.

STRUCTURALS—angles, channels, beams, etc.

PLATES—many types including free machining, abrasion resisting, etc.

SHEETS—many types and coatings

STAINLESS—Allegheny bars, plates, sheets, tubing, pipe, pipe fittings, etc.

TUBING—seamless & welded mechanical tubing & boiler tubes

INLAND 4-WAY SAFETY PLATE—for floors, ramps, stairs, truck platforms, etc.

MACHINERY & TOOLS—for metal fabrication

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Streamlining has made the Lee C. Moore Masts distinctive. More important, is the fact that the Moore streamline design makes the mast easier to transport, erect and use. There are no surplus braces or parts. Every piece has an important part to play in making these masts sturdy and efficient.

LEE C. Moore

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through one-piece bonnet construction

The rugged, jointless, steel bonnet of the Honeywell Series 700 Valve affords greater strength, simpler disassembly for inspection and maintenance . . . has deep, integral stuffing box built to superior performance standards, top-and-bottom packed lantern gland to minimize leakage. The Honeywell Series 700 wide band proportioning valve comes in a full range of styles and sizes . . . has *all* the features you look for in a fine valve. Write today for your copy of Bulletin 700-3.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 1906 Windrim Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
VALVE PRODUCTS

H HONEYWELL

First in Controls

ing the right to strike and, it seems, can retain that right only by accepting the same limitations on size and power that owners and managers had to accept two generations ago."

Guaranty Survey, published by Guaranty Trust Co. of New York.

What About the Oil Show

Sir:

We are interested in obtaining information concerning the coming oil show to be held in Tulsa this coming May. If information and plans are available, please forward them.

R. C. Rogan,
Clayton Manufacturing Co.
El Monte, Calif.

Editor's note: The International Petroleum Exposition will be held in Tulsa May 14-23, 1953 (See The Oil and Gas Journal, August 18, page 81). General manager of the exposition is William B. Way, P. O. Box 5246, Donaldson Station, Tulsa, Okla.

Plenty of Risk-Takers

"If the Rocky Mountain region doesn't yield a supply of oil to match its scenery, it won't be for lack of take-a-chance enterprise by the industry. Exploration there is already costing $2,000,000 a month . . . and is still expanding. No less than 117 exploration crews are reported at work in Montana and North Dakota alone."

Editorial in the Long Beach Press-Telegram.

Irresistible Force, Immovable Object

"Humble's net income in the first half of 1952 decreased as a result of higher operating expenses. Although costs continue to rise as wage rates and prices of materials advance, the price of crude oil realized now under government price ceilings is lower than in 1948."

Interim financial statement, Humble Oil & Refining Co.

CALENDAR

SEPT.

3- 5	Pacific Coast Gas Association, Ambassador Hotel, Los Angeles.
4- 5	Rocky Mountain Oil & Gas Association, refining committee, Newhouse Hotel, Salt Lake City.
8-12	Instrument Society of America, seventh national instrument conference and exhibit, Cleveland.
10-12	National Petroleum Association, fiftieth annual meeting, Hotel Traymore, Atlantic City, N. J.
11-13	American Institute of Chemical Engineers, regional meeting, Palmer House, Chicago.

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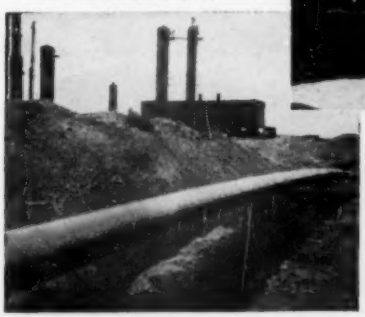
. . . Your first line of defense against Corrosion on Pipe, Pipe Joints, Couplings and Tanks

TAPECOAT requires no foreign adhesive to bond it to surfaces as the coal tar serves as both bond and protection.



*Reg. U. S. Pat. Off.

Underground or above ground, TAPECOAT withstands severe corrosive attack. Over the past 11 years, this original coal tar protection in handy tape form has proved its dependability in guarding against moisture, acids, alkalis, chemical fumes and other severe conditions. As your first line of defense, TAPECOAT assures greater protection, reduces maintenance and cuts pipe replacement cost.

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Originators of Coal Tar Tape Protection

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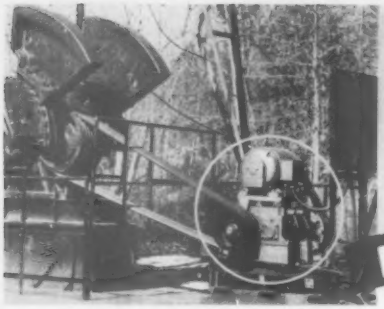

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FLEXIBLE!

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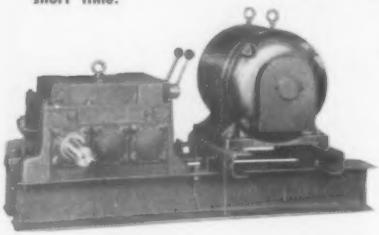

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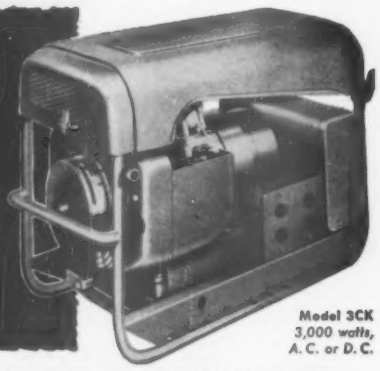

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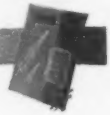

12-13 Association of Desk and Derrick Clubs of North America, first annual meeting, Shamrock Hotel, Houston.

13 Seventh National Chemical Exposition, Chicago Coliseum.

22-24 American Society of Mechanical Engineers, petroleum engineering conference, Hotel President, Kansas City, Mo.

24-25 Independent Petroleum Association of America, annual meeting, Skirvin Hotel, Oklahoma City.

25-26 Western Petroleum Refiners Association, regional meeting, Hotel Henning, Casper, Wyo.

29-30 American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City.

OCT.

1- 3 American Institute of Mining and Metallurgical Engineers, Mid-Continent fall meeting, Rice Hotel, Houston.

1- 3 National Association of Corrosion Engineers, South Central Region, technical program and committee meetings, Jung Hotel, New Orleans.

2- 3 Petroleum Electric Power Association, twenty-third annual meeting, Mayo Hotel, Tulsa.

3- 5 New Mexico Geological Society, annual field conference, Santa Fe.

4 John Zink Process Heating seminar, John Zink Co. plant, Tulsa.

6 Independent Natural Gas Association of America, annual meeting, Fontenelle Hotel, Omaha, Neb.

9-10 California Natural Gasoline Association, twenty-seventh annual fall meeting, Ambassador Hotel, Los Angeles.

12-18 Oil Progress Week.

13-15 Texas Mid-Continent Oil and Gas Association, thirty-third annual meeting, Hotel Texas, Fort Worth.

13-17 American Institute of Electrical Engineers, fall meeting, New Orleans.

16-17 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.

16-19 Permian Basin Oil Show, Odessa, Tex.

22-24 Society of Automotive Engineers, national transportation meeting, Hotel William Penn, Pittsburgh, Pa.

23-24 American Institute of Mining and Metallurgical Engineers, petroleum branch, West Coast fall meeting, Statler Hotel, Los Angeles.

23-24 Independent Petroleum Association of America, annual membership meeting, Skirvin Hotel, Oklahoma City.

24 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

27-28 Society of Exploration Geologists, Eastern Canada meeting, King Edward Hotel, Toronto, Ont.

27-31 American Gas Association, annual convention, Atlantic City, N. J.

30-31 Society of Exploration Geologists, Pacific Coast meeting, New Statler Hotel, Los Angeles.

30-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, annual fall meeting of Pacific sections, Statler Hotel, Los Angeles.

30-Nov. 1 Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver.

NOV.

3- 4 Society of Automotive Engineers, national diesel engine meeting, Chase Hotel, (tentative), St. Louis, Mo.

5- 7 Industrial Management Society, 16th

This slush nozzle is the heart of REED Twin-Blast Rock Bits. It makes them the fastest drilling, longest wearing bits ever produced by REED.

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Ask your **REED** representative about using Twin-Blast Bits on your rig. After checking your rig, your drilling practices and the formations you encounter, he can tell you what to expect.

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Greatly improved overall efficiencies have improved Reda performance as much as 25%; a substantial operating saving.

If you have a pumping problem, our engineering staff is always ready to assist you. Phone or write:

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PUMP COMPANY

BARTLESVILLE, OKLAHOMA

annual time and motion study and management clinic, Sheraton Hotel, Chicago.

6- 7 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6- 8 Gulf Coast Association of Geological Societies, annual fall meeting, Hotel Driscoll, Corpus Christi, Tex.

8-13 Oil Industry Information Committee, Conrad Hilton Hotel, Chicago.

10-13 American Petroleum Institute, thirty-second annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

13-14 Society of Exploration Geophysicists, midwestern meeting, Texas Hotel, Fort Worth.

17-18 American Institute of Electrical Engineers, subcommittee on electrically operated recording and controlling instruments, technical conference, Benjamin Franklin Hotel, Philadelphia.

20-22 Instrument Maintenance Short Course, jointly sponsored by Southern California Meter Association and Los Angeles Harbor Junior College.

21 Natural Gasoline Association of America, district meeting, Herring Hotel, Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, Statler Hotel, New York City.

DEC.

1- 3 New Mexico Oil and Gas Association, annual meeting, Albuquerque.

1- 6 Twentieth National Exposition of Power and Mechanical Engineering Grand Central Palace, New York.

5- 6 Interstate Oil Compact Commission, winter meeting, Wichita, Kans.

7-10 American Institute of Chemical Engineers, annual meeting, Hotel Cleveland (Hqs.) and Carter Hotel, Cleveland.

1953

FEB.

27 Natural Gasoline Association of America, regional meeting, Scharbauer Hotel, Midland, Tex.

MAR.

2- 6 American Society for Testing Materials, spring meeting, Statler Hotel, Detroit.

16-20 National Association of Corrosion Engineers, Hotel Sherman, Chicago.

18-20 American Petroleum Institute, annual spring meeting, Mid-Continent district, division of production, Mayo Hotel, Tulsa.

APR.

21-23 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

27-28 Independent Petroleum Association of America, mid-year meeting, Jefferson Hotel, St. Louis.

Apr. 29-May 1 Natural Gasoline Association of America, annual convention, Rice Hotel, Houston.

MAY

11-13 Southern Gas Association, Jung Hotel, Hotel, New Orleans.

14-23 International Petroleum Exposition, Tulsa.

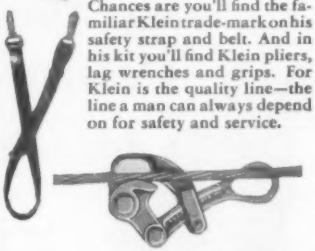
24-27 American Gas Association, production and chemical conference, Hotel New Yorker, New York City.

28-29 Natural Gas and Petroleum Association of Canada, London, Ont.

KLEINS

Quality A MAN CAN DEPEND ON

When a man goes up on a rig, or up on a pole, he wants to know his equipment is the best. Chances are you'll find the familiar Klein trade-mark on his safety strap and belt. And in his kit you'll find Klein pliers, lag wrenches and grips. For Klein is the quality line—the line a man can always depend on for safety and service.



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Announcement by

Anglo-Iranian Oil Company, Limited

IN ORDER THAT there should be no misunderstanding as to the scope and effect of the recent decision by the International Court of Justice in respect of the Iranian oil dispute Anglo-Iranian Oil Co., Ltd. wishes to bring the following statement to the attention of all concerned.

It has already been made clear that the decision of the International Court is not a decision on the merits of the case and that it does not in any way affect the Company's claim that the Iranian Government has acted illegally towards the Company in Iran. The decision means simply that the International Court, which only has jurisdiction to the extent that individual states have either generally or in a particular case accepted the jurisdiction of the court, has decided after considering the arguments advanced by both sides that it has no jurisdiction in this case.

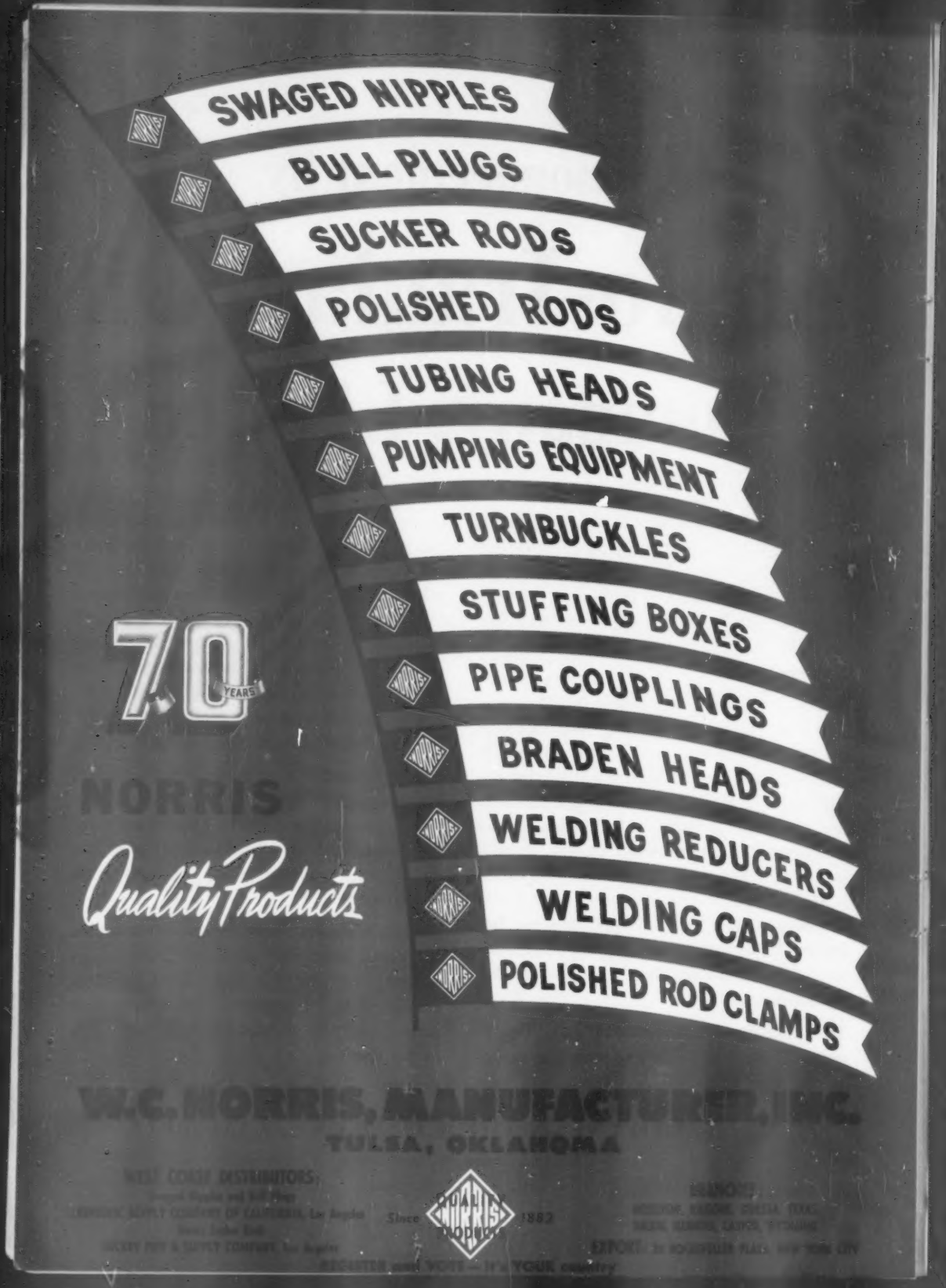
The Company's title to crude oil and oil products derived or to be derived from the area of its operations in Iran is in no way affected by the decision. In attempting to deprive the Company of this title and appropriating to itself the Company's properties in Iran the Iranian Government has acted in complete disregard of its solemn obligations to the Company and of the basic principle of the sanctity of contracts—a principle which is essential for maintenance of the necessary confidence for the continued development of world trade.

In these circumstances the Company remains confident no oil company of repute nor any tanker owners nor business men of standing will countenance any direct or indirect participation in the unlawful actions of the Iranian Government.

Should, however, any concerns or individuals participate directly or indirectly in transactions affecting the crude oil and refined products concerned this Company will take all such action as may be necessary to protect its rights in any country.

ANGLO-IRANIAN OIL COMPANY, LIMITED

Britannic House, Finsbury Circus,
London, E.C.2, England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THE OIL AND GAS
JOURNAL
TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY Speaking

Questionnaires

ONE of our editors was stopped by the manufacturing head of a large oil company with the question: "What's gone wrong in your general offices? Here it is Wednesday and I haven't received a questionnaire this week from the Journal." The editor, with equal facetiousness, asked his friend to be patient as he was sure the matter would be taken care of before the week's end.

Time was when the Journal's editorial representatives scattered throughout the country could in direct contacts pick up everything needed for publication. In those days a $250,000 or $500,000 expenditure was big news and always bobbed up in the usual news channels.

But times have changed. Petroleum is a mammoth industry with every division big business in itself. More happens in a week than used to happen in a month. Our enlarged staff still obtains most of what we print through daily contacts with the industry's key personnel.

But that is not enough. The questionnaires give us supplementary information which we need to round out our reports and analyses. In fact those who send out the questionnaires and compile the data they provide quite often run into something of major interest.

Our excuse for all this is that the more information we have the better we can do our jobs. So we ask your forbearance with emphasis on continued cooperation.

Census Department

SO important and necessary are vital statistics and interpretation in another phase of the Journal's activities that a separate department has been created. It is known as the Census Department and, like the proverbial housewife, the work of people in this department never ends. A census report which is up to date today shortly becomes historical.

This department also has to rely partially on questionnaires sent to operators, contractors, and departmental heads. The questionnaires go out under the name of Donald W. Wilson, who heads the department. He is a former high-school teacher with a fetish for completeness and accuracy, a prime requisite for this job. Incidentally for the benefit of those who have become confused, Don is not related to C.O. (double l) Willson, editor, whose name is signed to many of the editorial questionnaires.

Out of this department come a variety of reports covering every branch of the industry and segment thereof of value to the Journal and others. For example, the Journal's Annual Directory of Oil Refineries and Field Processing Plants, including key personnel, recently released for 1952-1953 is prepared by the Census Department.

Support the Bureau

Before we get off this subject of questionnaires we want to put in a plug for the A.P.I. program of speeding up the Bureau of Mines monthly report covering supply and demand in United States petroleum operations. This report is usually not available to the industry until more than 2 months after the close of the month surveyed.

This is not the bureau's fault but is brought about, we are told, by the failure of a few operators to send in their reports promptly. The more promptly these statistics are released the more value they have as a guide to current and future operations. If you are one of the guilty few we join with A.P.I. in urging that you make a special effort to send in your information shortly after the close of month.

Perhaps the answer to all this is for everybody in the oil business to have a questionnaire department. Which recalls our visit to the offices of a successful independent operator whose desk was covered with forms from state and federal governments, associations, publications, and the like and who wondered "When in h— am I going to have time to run my own business."

We tried to think of an adequate answer quickly, but didn't.

here's the plug

proved best by thousands of runs

Truth of the saying "Nothing succeeds like success" is outstandingly proved by the BAKER RETAINER BRIDGE PLUG! The "well proved" design—based upon the long famous Baker Cement Retainer—has performed successfully in countless thousands of wells—for every purpose—at all temperatures—and at all depths.

IDEAL FOR EVERY PURPOSE

For new well completions, work-overs, testing, squeeze jobs, well abandonments, and many other installations, you can be sure of fast, efficient, economical results with the Baker Model "K" Retainer Bridge Plug—Product No. 400.

The design of the plug affords ample clearance for fast, safe running-in, and the slips set quickly and positively. The packing element is held in sealing position by lead seals; packs off against all differential pressures; and prevents movement of fluid or gas either up or down the well. There is no need to place cement above the Baker Retainer Bridge Plug to effect a perfect seal, but, if desired, you can dump cement *on the same run* by using a Baker Model "B" Dump Bailer.

YOUR CHOICE OF TWO EASILY DRILLABLE TYPES

For temporary service, choose the Baker MAGNESIUM ALLOY Type Bridge Plug; for permanent installations, specify the CAST IRON Type which is stronger than the casing, and will outlast the casing if harmful well fluids are a problem. Either type drills up in record time because the drilling bit contacts the *very minimum* cross-sectional area; the *short over-all length* reduces drilling time; and the *segmented cast iron slips* are quickly broken up with cable tools, or a rotary bit.

CHOOSE YOUR SETTING METHOD

A BAKER BRIDGE PLUG (Product No. 400) can be set on tubing or drill pipe (in the same manner as the well known Baker Cement Retainer) but in these days of pipe shortages we suggest that you contact your choice of the leading wire line service organizations for setting a Baker Bridge Plug (Product No. 400-D) on an electrical conductor cable. You can thus avoid wear and tear on your tubing, and worthwhile savings of time result from wire line setting, particularly in deeper wells.

ARE YOU USING THE BAKER ADVISORY SERVICE?

Why not call the Baker representative in your area and discuss with him installation of a Baker Bridge Plug? You will find that he has valuable knowledge and helpful suggestions to solve your problems.

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RETAINER BRIDGE PLUG

Bugaboo of cartels and base prices

WHILE the Department of Justice, Federal Trade Commission, and Mutual Security Administration vie with each other in their charges against some or all of the seven international oil companies, various commentators appear most interested in the allegations involving cartels and the methods used in determining prices for crude oil and products.

All seven companies deny that they have been parties to voluntary cartels in their foreign or domestic operations. These arrangements are often confused with programs enforced by foreign governments. In developing their own domestic and foreign trade, strengthening their defenses, and assuring maximum revenue returns, many governments completely control petroleum operations within their own boundaries. Operators accept these regulations or they don't participate in the oil activities.

THEN there is the matter of selling crude oil and products to Europe from Persian Gulf sources based on Gulf Coast prices. It has been contended that such practices are prima facie evidence that a market is rigged and that no real competition exists.

The opposite is true. The use of base prices facilitates competition, and in the distribution of certain products, including oil, there could be no open markets without them. The commodity markets in which our Government participates from time to time, both as a seller and buyer, recognize this requisite of orderly marketing.

The Gulf Coast has been used as the base market in international oil trading for many years, regardless of point of delivery. The practice started because that area was the largest source of supply. With the other Caribbean countries, including Venezuela, Colombia, and Mexico, it still is.

Actually through compromise arrangements made at the insistence of of ECA, predecessor of MSA, the delivered European postwar prices have been substantially less than the Gulf Coast and Caribbean quotations plus transportation. If the European prices have been too high, then the going markets for crude oil and products in this country, which are reflected in the Gulf Coast export quotations, have been excessive and the agencies of Government may claim that they are entitled to additional recoveries.

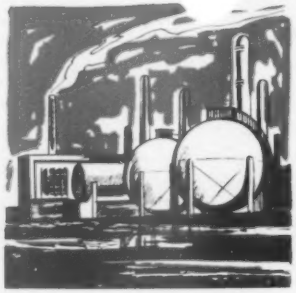
Middle East oil has become a formidable competitor of Western Hemisphere sources. Because of the expanding reserves and output of the Middle East, that area could become the base pricing center of the world.

Therein lies a trend of primary concern, not only to the domestic oil industry but to the entire economy of this country, including defenses. There are those in Washington who realize the strategic position of our international oil companies—so clearly demonstrated in recent years—and are trying to do something about it as a safeguard to future security.

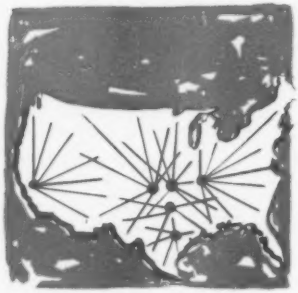
It is deplorable that their statesmanlike views are now being ignored in the interest of the coming election, with trumped-up charges which represent a new low in political opportunism by those in control of our affairs.

NOW... Anchor's facilities for marketing petroleum products are *better than ever!*

Anchor's large fleet of tank cars enable us to give fast and efficient service to our customers . . . to refiners this means a dependable outlet for natural gasoline, butane, propane, motor fuel and fuel oils.



Anchor's storage facilities have been enlarged so that our customers can depend on a year 'round supply of products . . . to our suppliers — an additional market for their products.



Anchor's strategically located distribution points PLUS 48-state distribution guarantees our customers faster service.

Anchor's organized and efficient staff have had years of experience in marketing petroleum products — they are always ready to give friendly help to both customers and suppliers.

Anchor's policy to dealers is, "marketing petroleum products is our business, our only business — we are never your competitors." This is one of the many reasons why LPG dealers like to do business with Anchor.

Whether you are buying or selling petroleum products — "Call Anchor First" and you'll see that our experience means more profit to you.

ANCHOR
PETROLEUM COMPANY TULSA

Anchorgas

SALES OFFICES: DES MOINES, OMAHA, TOLEDO, HOUSTON, LOS ANGELES

THIS WEEK

CARTEL.—Companies attack "pre-election smear" as irresponsible move which will sabotage their relations with foreign governments, undermine interests of American public in essential foreign oil properties. . . . Majors accused of dominating world oil issue statements denying all illegal acts hinted at in FTC report but save details of their position to present in a grand jury investigation into charges . . . Big rebuttal, not denied by Government, is that foreign operations have been carried out with full knowledge and often encouragement of State Department. . . .

GOVERNMENT.—Justice Department files three civil suits asking a total of $67,000,000 from four major American oil companies. . . . Amount represents Mutual Security Agency's estimate of alleged overcharges levied by companies on shipments of products to Marshall plan countries under aid program. . . . 'Delay sought by oil companies in connection with grand jury investigation on Government charges they conspire to control the world's oil supply. . . . Investigation originally set to begin September 3. . . .

ACTIVITY.—Production of crude and lease condensate averaged 6,295,925 bbl. daily for week ended August 23, up 15,300 bbl. daily from previous week. . . . 'Total well completions increased 70 wells to 934 for the week . . . Wildcat completions were up 22 wells to 228. . . . 'Rotary rigs operating in United States on August 25 totaled 2,313. Except for a small gain on August 4, rigs have decreased every week for the past 10 weeks. . . .

IN A RUT is this rig of Santa Fe Drilling Co. in the La Habra Heights area near Los Angeles. For 3 years and nearly 7 months the rig has been drilling in the same area and on only three locations, and it appears now that it will be there a while longer. The rig drilled 12 slanted holes and redrilled one well from its first location, moved 2,000 ft. and drilled seven more, and has now completed 18 producers on its third location. The wells are being drilled for Union Oil Co.

TRENDS.—Indicated demand on refineries for four major products in 5-week period ended August 23 was only 0.1 per cent greater than last year. . . . Gasoline was up 2.3 per cent. . . . Kerosine was down 16.6 per cent. . . . Distillate decreased 5.8 per cent. . . . Residual gained 2 per cent. . . . 'Major product stocks gained 29,415,000 bbl. in 5 weeks this year compared with 12,220,000 bbl. in corresponding period last year. . . .

PIPE LINES.—Salt Lake Pipe Line lets contracts for construction of a 330-mile, 8-in. products line paralleling its existing trunk from Salt Lake to Boise, Idaho. . . . Contract for the first 130 miles from Salt Lake goes to Macco Corp., the remainder to Engineers, Ltd., Pipe Line Co. . . . The $8,000,000 line is scheduled to be completed by the end of the year. . . .

INTERNATIONAL.—Petroleos Mexicanos completes its Tenixtepec 2 between the old Golden Lane trend and Poza Rica field for what it believes will turn out to be the most important discovery in the last quarter-century. . . . The well came in flowing 5,000 bbl. daily through a ⅜-in. choke at 5,235 ft. . . . 'British and Americans move to break stalemate in Iran with new proposal to Mossadegh which reportedly involves considerable easing of former position. . . . British would relax the campaign against export sales by the National Iranian Oil Co., and the U. S. would make substantial credits available to bolster the shaky Iranian economy. . . . This move, the British and American governments think, will stymie Communist bids for power and provide a better atmosphere for new negotiations. . . .

PRODUCTION.—Resolute Oil Co. makes a new pay discovery in old Badger Basin field of Park County, Wyoming, which may prove to be an important development in the general Big Horn basin area. . . . The company deepened an old Frontier sand producer from 8,660 ft. to the Dakota and is testing oil in that formation. . . . 'Amerada Petroleum announces important new Devonian reef strike 200 miles northwest of the Edmonton reef producing area in northwestern Alberta. . . . Company's rank wildcat, 1 Sturgeon Lake, found 90 ft. of porosity in Devonian at 8,915-9,015 ft. . . .

Oil Attack Pushed; Firms Reply

THE Government broadened its offensive against the petroleum industry last week.

There were these specific developments:

... Three civil suits were filed in New York federal court by the Department of Justice seeking $67,000,000. The amount represented alleged overcharges on oil shipments to Marshall plan countries financed by the Economic Cooperation Administration.

... A special grand jury prepared to open its investigation September 3 into charges that five major domestic and two foreign firms constitute a cartel which dominates the world petroleum industry.

... The Mutual Security Agency, successor to ECA, released a report on pricing policies followed by the major companies. It was designed to show that with one hand they were selling products to Marshall plan countries at one price and with the other were making other sales at lower prices, thus allegedly violating the foreign-aid law and ECA regulations.

Involved in the cartel charges are Standard Oil Co. (N.J.), The Texas Co., Standard Oil Co. of California, Socony-Vacuum Oil Co., Inc., and Gulf Oil Corp. All but Gulf were named as defendants in the civil suits. Foreign companies named in the cartel charges were Anglo-Iranian Oil Co., Ltd., and the Royal Dutch-Shell group.

The cartel charges were contained in a 378-page report of the Federal Trade Commission released last week. *(See The Oil and Gas Journal, August 25, page 78.)*

On this and the following five pages are presented news reports detailing these developments, together with company statements released after the FTC cartel report was made public and an explanation of the position of the major companies on those charges.

Preelection smear ... Several company officials last week voiced the belief that the combination of actions against the petroleum industry was primarily a preelection smear designed to grab favorable headlines for the administration in the weeks before the election.

They suggested that the release of the FTC report after nearly a year of secrecy and the opening of the grand jury investigation were too well timed to show other than political motives.

There was considerable speculation over the likely outcome of the furore being stirred up. Some industry leaders believe the charges will be allowed to die quietly once the election is over and a new administration in office.

The other end of the range of possibilities is some kind of divestment or dissolution action which might follow years of litigation. Whether the Defense Department, for example, would be willing to see the international American companies broken up is a question. It has been pointed out that the foreign competitors of the American companies probably would be quick to take advantage of opportunities resulting from the Government's action.

The civil action against the companies is expected by some to hang fire for years. The District Court in New York is regarded as probably the most crowded in the country, and the pretrial maneuvers will undoubtedly be long and involved.

"Cartel" Explanation

Preelection smear will undermine them abroad, companies believe; answers given to some specific charges of FTC

Dahl M. Duff

NEW YORK.—Responsible oil officials fear that the Federal Trade Commission's cartel report may seriously damage the industry's relationships with governments abroad.

The document will give further ammunition to nationalistic elements in many countries where the petroleum industry is usually made a prime target. It is felt that the report will intensify the pressure for state monopolies in various countries—Brazil, for example —where foreign oil capital already is waging a difficult fight.

Reports in the trade are that the top officials of one important foreign operating company have already been called by the government of the country concerned to explain the allegations made in the FTC study.

The FTC charges are expected to be used as justification for the policy of restricting or excluding foreign oil capital in such countries as Egypt, Bolivia, Italy, Argentina, and Turkey.

A highly placed company official last week said that the report is likely to be taken by some foreign governments as an official expression of the United States Government. He made the point that the petroleum report was an FTC staff study, and was so labelled, in contrast to half a dozen other FTC cartel reports which carried full FTC approval.

Agreements explained ... The so-called "as is" agreements of 20 and 25 years ago are the subject of the section of the FTC report which deal with production and marketing agreements. This subject occupies 149 pages of the 378-page study.

According to this official, what was not fully brought out is that these agreements never operated, and that insofar as the principal American participant, Standard Oil Co. (N.J.) was concerned, they were outlawed under a federal court consent decree in 1942.

This prohibited resumption of the agreements after the end of the war under penalty of contempt of court. Jersey Standard announced its acceptance of this decree March 25, 1942, and it is still in effect. What the public is apt to overlook is that the report contains no evidence of market-allocation agreements since that time, nor any material showing current law violations unless it is that regarding Middle East pricing, which this official termed a question of technical economics.

"Inference and innuendo" ... The report is open to attack on the grounds that it has sought to accomplish by inference and innuendo what cannot be shown otherwise. It should be obvious, he said, that to anyone reading the full report that the commission staff started from preconceived beliefs and then produced a document which would bear out those ideas.

This particular official emphasized that at no time in the preparation of the report were the companies ever consulted or given an opportunity to explain the material. The commission subpoenaed specified records of the companies February 10, 1950, and culled through thousands of documents.

For example, the FTC study attempted to show that the postwar agreement of Socony-Vacuum Oil Co., Inc., and Jersey Standard to buy crude from Anglo-Iranian Oil Co., Ltd., provided for certain markets allocations. This clause actually was inserted to narrow down the area covered by the *Force Majeur* provision, and the contract actually contained another provision giving full freedom in marketing the oil purchase.

Complex structure . . . The FTC made a point of the interlocking directorates and the complex corporate structure of the foreign oil industry.

This type of interlocating directors is legal, he said, even in the United States, where the prohibition is against the same director in competing companies.

A part of the FTC's case against the international companies also rests on the general charge of bigness.

Of the seven major international companies, the country should be glad that five of them are American and that there are this many American firms with the necessary capital resources and managerial skill to win a position in the foreign oil business, he added.

Market - demand proration . . . The feeling in industry circles here is that the strictly domestic oil companies and the independents in the business should be as concerned with the FTC charges as major international companies. This is because of the new attack made in the study on the principle of proration to market demand by the oil producing states.

One section in the FTC report reads:

"The stated objective of proration in the United States has always been conservation. . . In actual practice, however, the definition of conservation used by the oil industry has always combined this technological objective of maximum total recovery with the market objective of regulating production in order to stabilize prices."

The report seeks to show that the Interstate Oil Compact Commission came into being in the 1930's in conformity with a world-wide plan to control crude production.

Middle East pricing . . . The position of some officials of the major companies regarding Middle East pricing now seems to be that there is no basing-point system insofar as Persian Gulf crude is concerned. The present $1.75 price is an independent price not tied to those in the United States.

The FTC report makes a broad attack on the general basing-point pricing system, an indictment of the method itself, and one comment here was that the FTC's outlook on this appears to differ from that of Congress, which has considered measures legalizing delivered pricing in the United States.

The report's final chapter on Persian Gulf prices goes over ground already familiar as a result of the differences between the Economic Cooperation Administration and the Middle East operators. The FTC charged that the profits of the Middle East companies were realized under a system of pricing that "is supported and maintained by effort on the part of the major international companies to adjust production to world demand. Joint ownership and private agreements in foreign countries and the conservation movement in the U. S. all facilitate these efforts."

An observer here remarked that the domestic industry possibly should appreciate the efforts made by the companies in recent months to maintain their $1.75 price for crude f.o.b. the Persian Gulf. A reduction of this figure would certainly make it more attractive for nonaffiliated refiners to buy Persian Gulf oil and import it into the United States for the domestic market.

Pre-election show . . . Some experienced oil men here believe it possible that civil indictments may emerge out of the grand jury hearings about to get under way in Washington.

They expect the whole current attack against the international companies to slow down once the election is over, and they realize their present fight is as much public relations as it is legal. They are confident that the cases can be won once they are brought into court.

Still another attack on the oil companies was rumored here this week. It was reported without confirmation that Sen. Thomas C. Hennings, Jr., is preparing to reveal a "tax scandal" in the petroleum industry. There were no other details.

Firms Answer Charges

Companies issue statements, but because of pending action of grand jury, they save details for their day in court

FIVE American and two foreign oil companies accused of cartel activities by the Federal Trade Commission last week turned down an opportunity to refute the charges before the Senate small-business committee.

But the companies made it plain in public statements they consider the charges absolutely false and primarily an administration attempt to grab favorable headlines just before the fall elections.

The major oil companies apparently felt there was nothing to be gained by testifying before the committee on the eve of a grand jury investigation. This investigation would be more immediate and significant to the industry than any congressional study.

One of the most significant replies to FTC charges was that over the years the companies' foreign operations have been carried out with full knowledge and often with the encouragement of the State Department. In some cases, it was pointed out, the State Department has actively participated in working out international oil problems, one instance being the negotiations with the British Government when it sought to curtail the importation of dollar oil in 1949.

The companies also stressed the strategic importance to the United States of their foreign oil investments and operations. They pointed out that the effect of unsubstantiated charges is to undermine the value and stability of foreign oil investments.

Presented here are significant portions of the major statements of the companies, giving the company position regarding the FTC cartel charges.

Standard Oil Co. (N. J.) . . . "It can be readily understood that it is not possible for us by this time to review properly a document of around 300 pages which has been nearly 2 years in preparation. Until now we have never seen this FTC report nor were we given any opportunity during its preparation to comment on the material in it.

"On even a quick review, however, it is plain that many of the actions and events which are commented on in the report have a significance entirely different from that implied by the report.

"The net effect of this report, however, can hardly be other than to undermine the integrity of Americans whose investments abroad are of great value not only to the economies of the nations where they are made, but also to the economy and security of our own country. Such investments of this company have been **made openly, with the knowledge of our government,** and with the fullest regard to the legal and ethical conditions under which we must do business. . . .

"The grand jury proceedings obviously makes impossible any detailed comments at this time on the contents of the report. At the heart of the FTC report, though, is the presumed existence of an 'international oil cartel' in which our company is alleged to participate. We have repeatedly denied that Standard Oil Co. (N. J.) is a party to any such arrangement."

Esso Export Corp. . . . After the suit on Middle East pricing was filed, Esso Export Corp., a Jersey affiliate, made the following comments:

"As we said when these claims were made by MSA earlier this year, all of Esso Export's sales to purchasers in MSA countries as well as all of its other sales have been made at competitive prices.

"These prices are well known and have not been questioned by any of the countries or customers involved. The entire subject has been discussed thoroughly at frequent intervals with ECA, MSA's predecessor, in which it was pointed out that, in Esso Export's opinion, ECA was attempting to interfere with normal competitive prices.

"Because of the vital importance of the principle involved—free competition in the world market—Esso Export emphasizes that it will defend its position as strongly as it can."

Socony-Vacuum Oil Co., Inc. . . . "Our company, being a big successful company, is a natural target for those who find it to their advantage to attack bigness, as some do every 4 years at least.

"The current attack deals with the way it is claimed large oil companies, including ours, carry on their business abroad. In this connection, the term 'international oil cartel' has been rather generally and unjustifiably bandied about. . . .

"Regarding the Federal Trade Commission report, we have interests in foreign oil with a number of other companies. These have been widely publicized. Prominent among them are the Iraq Petroleum Co. and Arabian American Oil Co.

"Our entry into Iraq Petroleum Co. came directly at the instance of the United States Government. The appropriate departments in Washington were also fully advised when we acquired participation in Arabian American Oil Co. 4 years ago and they offered no criticism.

"We have been guided here by lawyers recognized as outstanding authorities on the American antitrust laws and abroad by lawyers familiar with local requirements. Our managements in the field receive this guidance with strict instructions to conform their activities accordingly. . . .

"As for the suit to recover alleged overcharges . . . while we have not yet seen the complaint, press reports say we are accused of using a two-price system by which the Government was charged a higher price for crude oil than the price charged for identical oil shipped simultaneously from the same source to other markets . . . between May 1949 and June 1952.

"During all of this time, Socony-Vacuum has charged only one price for its Middle East crude oil. As far as we are concerned, there is absolutely no basis for this two-price accusation. . . .

"We feel sure that if and when this case is ever tried, the court will find Socony-Vacuum blameless of these charges and that the public will recognize that we did an outstanding job in supplying oil to the Marshall-plan countries and that our prices were competitive and fair to all concerned.

"It is ironic that after having made a real contribution to the objectives of the Marshall plan and to the restoration of Europe's economy, we should now be charged with wrongdoing on a theory so strained that it is impossible to understand without having seen the complaint."

The Texas Co. . . . W. S. S. Rodgers, chairman of the board of The Texas Co. last week made public a copy of a letter to Senator Sparkman of the small-business committee, in it he said:

"On August 12, 1952, we denied that The Texas Co. is a party, either directly or indirectly through any subsidiary or affiliated company, to any international oil cartel or price-fixing arrangement of any kind, or any monopoly, whether international or domestic.

"We also deny the allegations of the Justice Department that this company and its affiliates have overcharged on sales of crude oil and petroleum products to ECA countries. The prices paid have been fair and equitable and in our opinion comply fully with the law.

"The Texas Co. intends to defend itself vigorously in these proceedings and we believe that under the present circumstances you will agree that the proper place to do this is in the courts having jurisdiction over these matters. Consequently we are not volunteering to appear before your committee and we are writing this letter to prevent any misinterpretation of our non-appearance."

"Our company and others have taken the spirit, aggressiveness, and fairness of American competitive enterprise into foreign fields. Our efforts have contributed greatly to raising the standards of living in the countries where we carry on our operations. They have added to this country's prestige abroad and have brought to it important military and economic advantages.

"We are enormously proud of our part in these accomplishments. We feel that our actions have been fair and in the best interests of the people of the United States as well as that of the people of the foreign nations involved.

"We hope you will agree that the unsupported charges which have been made and the publicity which has resulted have given the Kremlin a fine talking point in the countries in which we operate. It is difficult enough to carry on operations in foreign countries without being discredited by such actions by our own government. This has hurt not only the oil companies involved, but it will do serious damage to the people of the United States, to our foreign policy, and to our military effort.

Creole Petroleum Corp. . . . In Caracas, Creole Petroleum Corp. asserted the charges in the FTC report were "lacking in sound basis and issued by a commission which has neither executive nor judicial powers."

Creole said that the FTC had on other occasions taken "political and non-objective stands." It charges or insinuates that oil exploration and production has been controlled in eastern Venezuela. Creole said "that is simply a baseless fantasy."

American Petroleum Institute . . . Frank Porter, president of the A.P.I., which was accused in the FTC report of helping to further domination of the oil industry by the major companies, made this statement:

"The American Petroleum Institute does not engage, nor has it ever engaged, in any act that could be considered even remotely of a cartel nature.

"Any such procedure would be entirely foreign to the Institute's functions. The charges as made in the FTC report arise from a complete misunderstanding and misinterpretation of the Institute's efforts in the field of crude-oil conservation. In 1929, at the insistence of a government agency, the Federal Oil Conservation Board, it made through committees recommendations to that board looking to the conservation and prevention of waste of this irreplaceable natural resource. Time, study and experience have clearly shown that the progressive increases of oil production have been specifically related to conservation.

"The Petroleum Institute has the

ability to demonstrate on any fair basis that it has conducted itself and its operations in the public interest."

Statements from Europe . . . The principal British and Dutch companies named in the FTC report last week issued denials in London of the existence of any international oil cartel. The publication of the FTC report was prominently displayed in various British newspapers.

Anglo-Iranian Oil Co., Ltd., said that it "denies it is a party of any cartel activity or to any action contrary to the laws of the countries in which it operates."

Frank J. Hopwood, managing director of Shell Transport & Trading Co., said:

"I can state there is no international oil cartel. In fact, the oil industry is keenly competitive. It is a matter of common knowledge that measures of cooperation between members of the industry have been necessary and indeed have been sponsored by governments in order to ensure that the requirements of the world, both military and civil, should be met."

An identical statement was issued in The Hague in the Netherlands by J. H. Loudon, general manager of the Royal Dutch Petroleum Co., the other top partner in the Royal Dutch-Shell group.

The other two British companies, Iraq Petroleum Co., Ltd., and Kuwait Oil Co., Ltd., are subsidiary operating organizations. All these five companies were named in the subpoena for the federal grand jury investigation, but apparently the only one served is Anglo-Iranian which maintains a small office, mostly for purchasing, in New York. All five companies are headquartered outside the United States, and there is no indication any records from abroad will be delivered to Washington.

Civil Suits Filed

Justice Department asks $67,000,000 from four major oil companies; overcharges on Marshall Plan shipments alleged

Bertram F. Linz

WASHINGTON.—The Department of Justice has filed three civil suits in the U. S. District Court in New York seeking to recover more than $67,000,000 from four major oil companies and their subsidiaries.

This allegedly is the amount by which the Economic Cooperation Administration and its successor, the Mutual Security Agency, were overcharged on Middle East oil delivered to Marshall Plan countries.

Recovery of further sums will be asked during the trial of the suit, as the postaudit of further sales is completed. The original calculation covers shipments between May 3, 1949, and May 20, 1952. The alleged overcharges may eventually reach $100,000,000.

Approximately 231,900,000 bbl. of Middle East crude and refined products for which the Economic Cooperations Administration paid $464,200,000 between April 1948 and December 1951 are involved in the litigation against the supplying companies.

These figures were cited by the Mutual Security Agency in a report to the Senate small-business committee on its controversy with the companies on the pricing of Middle East oil. The report was transmitted August 15 and made public last week.

During the life of ECA, the report said, the Marshall Plan countries imported a total of $4,606,000,000 worth of crude oil and refined products of which United States companies supplied $2,142,000,000 worth, with ECA financing $1,202,000,000, or 56 per cent.

ECA-financed shipments of crude, gasoline, kerosine, distillate and residual amounted to $987,000,000, 82 per cent of the total financed. The three major marketing companies, Standard Oil Co. (N.J.), Socony-Vacuum Oil Co., and California-Texas Oil Co., made 88 per cent of the shipments in this category, it was said.

The three suits . . . Recovery of $31,795,619.64 is asked by the government in a suit naming Standard Oil Co. (N.J.) and its wholly-owned subsidiary, Esso Export Corp.

Nearly $21,500,000 is sought in a second suit against Standard Oil Co. of California and The Texas Co. and their jointly-owned subsidiaries, Bahrein Petroleum Co., California-Texas Oil Co., Caltex Oceanic, and Mid-East Crude Sales Co. The last three are Bahamas Islands corporations, with home offices in New York.

A third suit seeks $14,118,498.52 from Socony-Vacuum Oil Co. and its wholly-owned subsidiary, Socony-Vacuum Overseas Supply Co.

In each suit the sums named are minimum in that the court is asked also to award the Government such additional sums as may be due for alleged overcharges after May 20, plus interest and costs and such other relief as it may deem just and appropriate.

Policy, laws cited . . . The companies cite the policy stated in (1) the foreign-aid laws of limiting the prices for commodities bought with funds appropriated by Congress and (2) the administrative regulations establishing specific standards for the determination of eligible prices. The latter provides that prices charged for shipments of crude oil to participating countries may not exceed the price charged on any comparable sales made by the same suppliers and that suppliers' prices may not exceed the export-market price for crude oil in the source country.

The government then charges that the defendents represented to ECA and MSA that their prices for Middle East Crude sold under the foreign aid program were the lowest market prices and in complete conformity with the standards prescribed by those agencies. In accepting payment, the companies executed certificates containing assurances of such conformance and promising to reimburse if their prices later were found to exceed the prices permissible under the regulations.

Department officials in Washington explained that the suits are based on the allegations that the prices on Marshall Plan shipments were higher than:

. . . **the market price prevailing** in the United States for similar Middle East crude after adjustment for differences in the cost of transportation to destination, quality, and terms of payment;

. . . **prices charged** in comparable export sales of similar crude made concurrently in the companies' non-government shipments to importing companies in the Western Hemisphere;

. . . **the existing market price** at the time of purchase in comparable sales of similar crude made from the source country by the principal suppliers therein in their non-government shipments to importing companies in the Western Hemisphere. The prices charged ECA and MSA ranged from $1.75 to $1.88 per bbl. f.o.b. Persian Gulf and $2.25 to $2.61 f.o.b. Eastern Mediterranean.

Officials explained that the two-price system was established by channeling all ECA-MSA sales through a subsidiary and all other sales through the parent company. Thus, Esso Export was represented as making all Marshall Plan sales for Jersey Standard, while other sales were made by the parent company. In none of the suits was it

alleged that the subsidiary which made the ECA-MSA sales also made other sales at lower prices.

Long a controversy . . . The pricing of Marshall Plan oil has been the subject of controversy over a long period and the problem was inherited by MSA when it took over ECA's responsibilities last January 1. MSA referred the matter to the Department of Justice some weeks ago and, coincidentally with the filing of the cases, released a report and some of the statistical material on which the government charges were based.

The suits brought by the Government in New York are civil cases and involve no allegations of criminal violations. The whole matter, however, is expected also to be laid before the special grand jury to be empaneled in Washington this week to investigate the alleged international cartel on which the Federal Trade Commission issued a lengthy report a week ago.

MSA Outlines Suit

Government agency relates background of pricing questions in a lengthy report describing its reasons for filing suits

Presented here is a summary of the Mutual Security Agency report to the Senate small-business committee which is being used as the basis for three civil suits against four major oil firms —Standard Oil Co. (N. J.), The Texas Co., Standard Oil Co. of California, and Socony-Vacuum Oil Co., Inc. The suits were filed last week to recover sums up to $100,000,000 which MSA alleges it and its predecessor, the Economic Cooperation Administration, were overcharged by the companies for Middle East oil delivered to Marshall-plan countries.

THE question of prices was brought up by ECA in the summer of 1948, when extensive discussions were had with the companies concerning their pricing practices.

At that time the f.o.b. prices charged varied somewhat from company to company and, in some instances, between different destinations. By November 1948, after a series of changes, all the companies were charging $2.03 per bbl. for 36°-gravity A.P.I. Arabian crude on shipments to Marshall Plan countries.

The $2.03 price represented a reduction of 19 cents per barrel from the $2.22 price which had prevailed early in 1948.

"Our analysis," MSA said, "indicated that the $2.22 price (which was an Iranian crude price) was explained by the following: The crude oil price f.o.b. United States Gulf Coast, plus freight at United States Maritime Commission rates to the United Kingdom, less freight at U.S.M.C. rates from the Persian Gulf to the United Kingdom.

"The $2.07 price was apparently explained by the following formula: The crude oil price f.o.b. Caribbean, plus freight at U.S.M.C. rates to the United Kingdom, less freight from the Persian Gulf to the United Kingdom at U.S.-M.C. rates.

"California-Texas Oil Co., Ltd., explained the $2.03 price as resulting from the same formula which produced the $2.07 price, less a 4-cents-a-barrel refining-value differential between Arabian crude and Caribbean crude."

Propriety questioned . . . The question of the propriety of the prices charged for Marshall Plan oil arose in 1949 when a study of United States import statistics showed that imports of Middle East crude into the United States had been growing in volume over a period of about 6 months at realized prices which "appeared to be considerably lower."

"Moreover," MSA reported, "since exports to the United States indicated a possible surplus of Middle East crude oil over Eastern Hemisphere requirements, the validity of the $2.03 per barrel pricing formula was open to question, since the formula was based on the theory that the supply of Middle East oil was insufficient for European needs and continued imports of Western Hemisphere crude oil were required."

Consultants called in . . . The matter studied by a group of five consultants appointed by ECA, consisting of Max Ball, Washington oil and gas consultant; Edward S. Mason, dean of the graduate school of public administration of Harvard University; Sumner Pike, then commissioner of the Atomic Energy Commission; George W. Stocking, dean of the graduate school of economics and business administration of Vanderbilt University; and L. S. Wescoat, president of Pure Oil Corp.

That group reported that available Middle East supplies of crude during 1949 would be approximately adequate and perhaps slightly more than adequate to meet European requirements, and, "under these circumstances, the present formula by which ECA authorizes a maximum price for purchases of Middle East oil, which formula was based on European needs of Western Hemisphere oil, is ceasing to be justified."

Another price cut . . . The eventual result of the investigation and discussions with the companies was a 15-cent cut in price to $1.88.

ECA considered the over-all 34-cent cut in Middle East crude prices "significant," but was still concerned that it should not be charged higher prices than those realized on substantial shipments of Middle East oil to non-ECA destinations. ECA was particularly concerned with the situation in the United States where the companies were realizing $1.30 per barrel, a figure calculated by ECA by deducting freight costs at U.C.M.S. rates from the prevailing delivered price of comparable crude on the Atlantic Seaboard.

And another . . . In view of this differential, ECA revoked a regulation permitting the companies to charge different prices on sales comparable to those made to customers in the United States, and, as a result, the price for Middle East oil was reduced to $1.75 per barrel, first by Gulf Oil Corp. and later by Jersey, Caltex, and Socony-Vacuum.

Still not satisfied, ECA again called in its panel of consultants, which, after discussions with ECA representatives, expressed satisfaction with the then prevailing price. However, it recommended that any substantial rise above U. S. East Coast prices, less tariff and competitively determined transport cost from the Persian Gulf, should call for renewed examination of the price at which ECA financed shipments of crude from that area.

Rate fluctuation . . . Late in 1950, freight rates began to increase substantially and it became apparent to ECA that the prices realized on shipments to the Western Hemisphere were declining accordingly, the MSA report continued.

ECA also discovered that all shipments to the Western Hemisphere since the date of its regulation had been billed not at $1.75 but at a uniform f.o.b. price of $1.43 per barrel, and early in 1951 called on its suppliers to explain why it should not receive refund of the alleged overcharges.

Tapline completed . . . Meanwhile, the Trans-Arabian pipe line had been placed in service. That line, MSA charged, was given steel allocations in

the steel-shortage days immediately following the war on the argument that its construction would result in substantially lower transportation costs which would be passed on to European consumers.

The established price of $2.41 at Sidon, however, represented no savings at that time to European purchasers as compared with oil moving by tanker around the Arabian Peninsula and through the Suez Canal into the Mediterranean. When asked for an explanation the companies insisted that "the large risks inherent in the Middle East made it essential for them to maintain Eastern Mediterranean prices, in order to amortize the cost of the new pipe line as quickly as possible."

At that time ECA did not question the 66-cent pipe-line charge applied against ECA-financed movements loaded at the Eastern Mediterranean. Later, MSA said, figures relating to the pipeline charge revealed that the charge on Western Hemisphere shipments was considerably less than 66 cents.

Case submitted . . . Early this year, "after long and careful consideration of the oil companies' rejoiners to ECA's proposed claim' for refund of overcharges on Middle East crude oil, and also after extensive informal discussion and review of the case with Department of Justice attorneys, MSA formally submitted to the Department of Justice for possible litigation its case of overcharges on Middle East crude oil shipped from both the Eastern Mediterranean and the Persian Gulf," the report said.

"At the same time, MSA again opened serious discussions with the oil companies involved in the hopes that they would reduce Middle East crude-oil prices. By the middle of 1952, the companies involved had made it clear that they had no intention of reducing prices."

The report disclosed that ECA also was dissatisfied with the prices charged for petroleum products from the Middle East and made efforts to secure reductions.

"The companies interpreted ECA's inquiries as an attack upon the principle of freight absorption, and they defended this principle with vigor," the Senate committee was told. "The companies went on to point out that they considered Persian Gulf product movements to Europe as a temporary necessity in order to hold markets until sufficient refining capacity was developed in Europe to make it independent of Persian Gulf products; that in view of this long-range trend, Persian Gulf product movements to Europe would decline and ultimately be eliminated. Meanwhile, however, the companies felt that it was necessary to 'absorb freight' on Persian Gulf product shipments to Europe in order to 'meet the competition' of supplies from the Caribbean which delivered at a lower cost."

Shipments cut off . . . In September 1950 ECA published a regulation designed "to eliminate price discrimination within the Mediterranean area," which "met with strong reaction by the oil companies and the trade press."

Since the effective date of the new price limitations no products have been supplied from the Middle East to participating countries in the Mediterranean under ECA or MSA financing, except for fuel oil in the winter of 1951 when the city of Athens was faced with a cut-off of electric power due to inability to produce oil for non-dollar payment. MSA then granted a 6-month waiver and Caltex supplied at the United States Gulf price plus freight from the Persian Gulf.

MSA announced in June that it was discontinuing the financing of nonspecialty crudes.

More Time Sought

Oil firms under subpoena ask district judge for delay in which to round up documents for grand jury investigation

WASHINGTON.—Oil companies involved in the federal grand jury investigation scheduled to open this week were fighting vigorously over the weekend for more time in which to gather up their records and for a clarification of what the jury is to investigate.

They are finding it impossible to search through file after file of records and assemble the documents required by September 3 *(The Oil and Gas Journal, August 25, page 82).*

Acting individually, the companies were asking the District of Columbia federal court for an extension.

Standard Oil Co. of California, the first to come in, sought a 2-week extension but was given only an additional week by Judge Burnita S. Matthews.

There were indications that the companies would attack the validity of the subpoenas calling for millions of documents in the aggregate and would try to induce the court to require the Department of Justice to show just what it proposed to bring up before the grand jury.

In requesting a 2-week extension, John T. Cahill, attorney for California Standard, charged the Government is attempting to rush the companies into submitting records dating back to 1928.

Attorneys for the companies would like at least a 60-day delay in which to meet the requirements of the subpoenas. They also want to have both the grand jury investigation and the government cases against the companies for alleged overcharges on Marshall-plan oil shipments put in the same jurisdiction, since the same records are expected to figure in both.

Early testimony out . . . It was because of the pending grand jury investigation that the companies declined to appear before the Senate small business committee last week to answer the charges of cartel activities laid down in the Federal Trade Commission report.

This was made clear by W. S. S. Rodgers, chairman of the board of The Texas Co., in a letter to Chairman of the Small-Business Committee John J. Sparkman of Alabama. The company, Rodgers said, "intends to defend itself vigorously in these proceedings, and we believe under the present circumstances you will agree that the proper place to do this is in the courts having jurisdiction over these matters."

U. S. hurting itself . . . Rodgers charged that the administration is playing into the hands of the Communists and is making it more difficult for the oil companies operating internationally, by launching such an attack on the industry at this time.

"We hope you will agree that the unsupported charges which have been made and the publicity which has resulted have given the Kremlin a fine talking point in the countries in which we operate," he said. "It is difficult enough to carry on operations in foreign countries without being discredited by such actions by our own Government. This has hurt not only the oil companies involved, but it will do serious damage to the people of the United States, to our foreign policy, and to our military effort."

Two courses open . . . If the companies succeed in securing a delay, the Government will have two courses open to it. It can convene the jury September 3, as planned, and then recess it or go ahead with the taking of evidence from government and other witnesses. The latter course might be adopted to speed up the investigation.

40-Acre Spacing Out

Most Spraberry operators now believe 80-acre spacing is a must for profitable operation except in two trend areas

MIDLAND, Tex. — Continuation of 40-acre spacing of wells in the Spraberry trend now appears improbable.

A possible bright exception is the Benedum area, located in the south end of the trend.

During the past 2 months dozens and dozens of staked locations in proven sectors have been abandoned because of the uneconomic outlook for those locations spaced on a 40-acre pattern.

The consensus of principal operators and many independents now is that the Spraberry must be drilled on wide well spacing if payouts are to be obtained. This view, while not new, is now quite widespread.

No profit here . . . Eighty-acre spacing has been advanced in recent weeks as the best way to halt abandonment of proven locations in the face of poor reservoir performance. The rapid drop in bottom-hole pressure, accompanied by the slump in individual well output, is causing alarm to majors and independents alike.

The question of 80-acre spacing for the Spraberry trend will be the subject of a hearing before the Texas Railroad Commission September 11.

One major company which had as many as 50 rigs drilling in the trend a year ago, now believes the average $90,000 Spraberry oil well on a 40-acre tract will hardly break even. Today that company is operating only a few rigs throughout the trend.

Another major operator, located in a portion of the Spraberry trend which has a higher recovery, has held up additional drilling until an 80-acre spacing pattern is established, declaring that drilling on the present 40-acre pattern is not justified.

Two exceptions . . . The richer exceptions are Benedum-Spraberry field and possibly North Pembrook - Spraberry field. These are located at the south end of the trend in eastern and northeastern Upton and northwestern Reagan counties.

The northeastern Upton County section of North Pembrook "promises to be a good producing area," according to Elmer Simpson, San Angelo, deputy supervisor of Railroad Commission District 7-C.

Benedum-Spraberry, according to a district geologist of Midland, is a closed structure and is entirely separate from the main trend area.

Both men agreed that Benedum wells will pay themselves out and make a profit.

One major company has four producers in the south end of Benedum and plans to drill another 25 or more wells in that field. Another firm now has 27 producing Spraberry wells in Benedum and has "essentially completed its drilling program on 80 acres or less."

General outlook gloomy . . . The economic picture along the trend north of North Pembrook is a gloomy one, however.

An engineer assigned to the Midland office of Sohio Petroleum Co., which has 65 producing wells in the southwestern Glasscock portion of Driver-Spraberry field, stated flatly that 80-acre spacing is essential if Spraberry development is to continue.

"The Spraberry is running close," he said. "We need 80-acre spacing to make wells pay out. It costs us approximately $90,000 to drill each Spraberry well. These wells will pay out about the same amount. We will do very well, in fact, if they pay out on the 40-acre spacing pattern at the present rate of drop in reservoir pressure."

One independent company does not think too highly of the recovery potential of the North Pembrook-Spraberry field, one of the better producing areas.

"We have four wells in this field," their district petroleum engineer said, "with one now in the process of completion. No more will be drilled. These wells may pay out, but it will be over a very long period of time. With the possible exception of our operations in the Benedum area, we will do no more drilling in the trend until an 80-acre spacing pattern is established."

"Although we have some scattered leases up on the trend," another company engineer said, "we do not expect to do any further 40-acre drilling up there. It just won't pay out."

Why wider spacing? . . . One example of this need for 80-acre, or even 160-acre, spacing may be found in the performance of 57 wells in Tex Harvey field of eastern Midland County. These wells, according to competent engineers, indicate a recovery of 600 bbl. of oil per acre by primary methods, or 24,000 bbl. per well on a 40-acre spacing pattern.

The 57 wells cost an average of $90,000 each to drill. The gross return, if only 24,000 bbl. of oil is recovered, will be $63,600. This represents an initial loss of $26,400 per well before payment of royalties. High maintenance costs after the wells go on the pump will add to the loss.

Had these wells been drilled on an 80-acre spacing pattern, it was estimated, the recovery per well might be 42,000 bbl. of oil. The return to the operator, before payments of royalties, taxes, and maintenance costs, would be $111,300. In explanation of these figures some Spraberry estimators say that a well draining 80 or 160 acres will recover seven-eighths of the recoverable oil now being recovered by wells drilled on the 40-acre spacing pattern.

Drilled on a 160-acre spacing pattern, a well would, if these estimates are correct, recover 84,000 bbl. of oil. This recovery would return $222,600 to the operator, thus insuring a profit after payment of royalties, taxes and maintenance costs.

One well in the central portion of the Tex Harvey field, drilled on the 40-acre spacing pattern, recovered 35,000 bbl. of oil, or 875 bbl. per acre, in 17 months. It then declined to a point where it was producing no oil, gas, or water. This well, therefore, produced oil worth $92,750 before arriving at a point of at least temporary depletion.

Unit Signatures Added

DALLAS.—Only the signatures of 5 per cent of the royalty owners are needed to submit to the Texas Railroad Commission the proposed unitization program for Kelly-Snyder and a portion of Diamond M fields.

R. F. Bryant, Jr., Magnolia Petroleum Co. and chairman of the Scurry Area Canyon Reef Operators Committee, said that signatures of 5 per cent

of the royalty owners were obtained last week, bringing the total up to about 60 per cent.

The committee already has commitments from operators controlling more than 90 per cent of the working interest in the proposed unit area.

The unitization program calls for a program of gas and water injection to increase ultimate recovery in the reef fields. The plan would unitize 1,229 wells on more than 47,000 acres in the prolific Canyon reef fields centering near Snyder, in Scurry County.

INDUSTRY AFFAIRS

New Sinclair Firm

Function will be to sell and produce petrochemicals

NEW YORK. — Sinclair Chemicals, Inc., has been formed as a direct subsidiary of Sinclair Oil Corp., to take over the production and sales of petrochemicals.

JOHN A. SCOTT

These functions formerly were handled by Sinclair Refining Co.'s petrochemical division. Through this division, the Sinclair organization has been actively promoting hydrocarbons, special solvents, chemical polymers, petroleum sulfonates, and several chemical byproducts of the refining process.

Organization of the new subsidiary is part of Sinclair's "plan for balanced progress," according to P. C. Spencer, president of Sinclair Oil Corp.

Why it was done... "Further expansion in the field of petrochemicals is a natural and logical step for us at this time," Spencer said. "By converting both light and heavy fractions, which heretofore have been sold largely as fuels, into chemical products for which there is a growing demand, we not only will be upgrading our sales but, of equal importance, further diversifying our company operations."

The new subsidiary, also headed by Spencer as president, will utilize the research facilities of Sinclair Research Laboratories, Inc., but will have its own research staff and market-development department, the announcement said.

John A. Scott, manager of the petrochemical division since its inception, will be executive vice president of the new company. E. W. Isom, chairman of the board of Sinclair Research Laboratories, Inc., and director of Sinclair research for more than 35 years, will be chairman. Headquarters of the new company will be in the Sinclair Oil Building, 600 Fifth Avenue, New York.

Petrochem Report This Issue

This issue of the Journal contains on pages 102-105 the first of three timely and important articles on petrochemicals—as recently reported to the White House.

These are from the new "Report to the President of the United States by the President's Materials Policies Commission, June 1952," (also called the Paley Committee Report).

The Journal's article published in this issue, is entitled "Forecast for Petrochemicals." The following ones will be "Oil and Gas as Chemical Raw Materials," and "Petrochemical End Products."

First-Half Earnings Down

NEW YORK.—Net earnings of the oil industry during the first half of this year were down about 1.7 per cent from the first half last year—largely because of the oil strike late this spring.

Fifty-two oil companies reporting for the first half showed aggregate net income of $1,167,322,000, against $1,187,888,000 for the same period last year, according to the periodic report compiled by Carl H. Pforzheimer & Co.

The loss in earnings due to the strike more than offset earnings gains during the first quarter of the year when oil-company profits averaged about 6 per cent higher than in the first quarter of 1951.

Nearly all companies were affected by the shutdown to some extent, but those operating in the Gulf Coast and Mid-Continent areas were hardest hit, with losses in the crude-production category felt most.

Companies with operations principally in other areas of the United States fared somewhat better, with 15 of the 52 companies even chalking up earnings gains over the first half last year. Best earnings comparisons were made by firms which benefitted from increased foreign operations.

Tax Records Expected

NEW YORK.—New records in gasoline-tax collections this year were forecast here last week by the American Petroleum Industries Committee.

Combined receipts of the federal and state governments will exceed $2.75 billion, the A.P.I.C. predicted.

The industry organization based its forecast on its semiannual survey, which showed that state motor-fuel tax receipts during the first half of this year totaled $918,681,000, an increase of 10 per cent over the same period last year.

If consumption of gasoline continues at its present rate, the A.P.I.C. said, state tax collections will reach $1,984,000,000 by the end of the year, compared with $1,803,802,000 in 1951.

Increases in tax receipts were reported in 44 states and the District of Colombia. The A.P.I.C. said 1952 state collections would run about 87 per cent ahead of 1946 tax receipts.

The federal tax of 2 cents a gallon is expected to yield a record $804,223,000 this year, the A.P.I.C. said, compared to $607,756,000 in 1951.

Industry Briefs

OIL CITY, Pa.—The Venango County oil producing properties and private pipe line operated by Brundred Oil Corp. have been purchased by Quaker State Oil Refining Corp. The purchase covers approximately 2,900 acres on which are located 1,100 wells, and does not include Kansas and Kentucky properties of Brundred.

MIDLAND, Tex.—Sohio Petroleum Co. has moved its West Texas-New Mexico district headquarters here from Abilene. Walter W. Wilkinson is district geologist; A. K. Hood, district superintendent; and Frank Johnson, district land man. The district covers 121 counties in West Texas and West Central Texas and 13 counties in Southeast New Mexico.

DALLAS.—San Juan Oil Co. has contracted to operate 17 oil and gas wells in Joyce Richardson and Refugio-Heard fields and a natural-gasoline plant at Refugio-Heard field for Reiter-Foster Oil Corp., New York. Reiter-Foster recently acquired the properties formerly operated by Federal Oil & Gas Industries, Inc., and Bennett Oil & Refining Co.

CANADA

Eyes on Alberta

A.I.O.C. group arrives to study production venture

EDMONTON, Alta.—A team of officials from the Anglo-Iranian Oil Co., Ltd., recently arrived from London, has announced that the company is studying plans to enter the crude-oil production picture in Alberta.

The party was headed by Peter T. Cox, of London, export manager for D'Arcy Exploration Co., a subsidiary of Anglo-Iranian. Cox stated that J. W. Jackson, who has been appointed representative in Canada for the D'Arcy company, will make his headquarters in Calgary where the company will open a small office.

The party made known its intentions of commencing operations in Alberta during a visit to N. E. Tanner, Alberta minister of mines and minerals, and H. H. Somerville, deputy minister.

No early decision . . . Cox said the company intends to carry on various studies in Alberta in regard to crude-oil production, which might take months to complete. These surveys would have to be completed before any decisions were reached on future operations.

He also said that present plans do not involve development of the McMurray oil sands, in northeastern Alberta, which if brought into the picture would be "incidental" to the present phase of studies.

Cox formerly was general manager of Anglo-Iranian Oil Co.'s oil fields in Iran, now nationalized by the Iranian Government. Jackson was superintendent of Agha Jari field, 90 miles from the main plant at Abadan.

With these two men on the Edmonton visit was R. M. S. Owen, chief geologist for Kuwait Oil Co. Owen is on leave from his company. J. F. Watson, of London, a geologist for Anglo-Iranian, is expected to join other representatives here soon.

Devonian Strike Reported

EDMONTON.—Amerada Petroleum Corp. has announced an important new Devonian reef strike 200 miles northwest of the Edmonton reef producing area in northwestern Alberta.

The rank wildcat, 1 Sturgeon Lake, on LSD 7, 32-71-23w5, found 90 ft. of porosity in the Devonian reef at 8,915-9,015 ft. First drill-stem test from 8,916-29 ft. with tool open 70 minutes got gas to the surface in 8 minutes and oil in 56 minutes. The well flowed by heads.

Recovery was 360 ft. of oil and 90 ft. of oil and mud. The second and third tests all recovered oil. The latest test from 8,985-9,015 ft., open 90 minutes, got 4,328 ft. of salt water and 2,250 ft. of oil.

Damage Set at $25,000

EDMONTON, Alta.—Damage caused by a recent fire to a cracking unit of the Imperial Oil, Ltd., refinery here is estimated to run at about $25,000.

The fire was brought under control after a 2-hour fight. Herb Moor, refinery superintendent, said the fire was caused by failure of a line feeding crude oil to a thermal-cracking unit.

Officials estimated that the refinery would be back in full-scale operation within a week. It has been processing slightly more than 22,700 bbl. of crude daily under normal conditions.

ROCKY MOUNTAIN

Operating Rigs Decline

DENVER.—The number of active rotary rigs in the Rocky Mountains has dropped since the recent steel strike, but not to the extent noted in some areas of the country.

At present 225 rotaries are operating, compared with June's high mark of 244.

Montana and North Dakota have shown increases, while the number of rigs operating in Colorado and Wyoming has shown a decline.

Last week operating rigs in the Rocky Mountains included: Montana 49, Colorado 21, Nebraska 15, North Dakota 30, Utah 25, and Idaho 3.

New Badger Basin Pay Found

CODY, Wyo.—A new pay discovery in the old Badger Basin field in Park County, Wyoming, was made last week by Resolute Oil Co.

The company deepened a Frontier sand producer from 8,660 ft. and tested Dakota oil between 9,850 and 9,870 ft. The company was preparing to begin a second deepening operation to confirm Dakota production in what may prove to be an important development in the general Big Horn basin area.

Badger Basin field at one time held the record for production depth in the Rocky Mountains. The field was opened in 1950 and has produced more than 2,000,000 bbl. of oil from the Frontier sand.

WEST COAST

Harbor Funds Released

LONG BEACH. — The release of $5,000,000 in impounded oil revenue funds received from its Harbor properties has been approved by the Long Beach City Council, the money to be used without restrictions by the Harbor Department.

An additional 40 per cent of the year's oil revenue also will be released during 1952-53 for use by the department in its subsidence-remedial work. This should amount to approximately $9,000,000 based on present production figures.

Drilling Course to Start

LONG BEACH. — A new 2-year course in oil-well drilling will begin September 15 at Long Beach City College. The course is conducted in cooperation with the American Association of Oil Well Drilling Contractors.

The new class will be the fifth in the program which was started four years ago at the request of A.A.O.D.C. The association cooperates with the college in developing course material and has offered employment on drilling rigs to students during summer vacations to give them practical experience.

A drilling-mud control class, given in ten 3-hour sessions on Monday and Wednesday nights, will start September 22. This is the association's approved course which has been given regularly for several years.

Cementing Memorial Planned

SANTA BARBARA.—The first successful cementing job ever performed in California, and in the world, will be commemorated by a historical monument on September 20.

Under the sponsorship of the Petroleum Production Pioneers, dedication ceremonies will be held at the well site 5 miles northeast of Lompoc. Following this, members will meet at the Union Oil Co. picnic grounds in Orcutt for the annual fall barbecue.

Guest of honor will be Frank F. Hill who, as an employe of Union, in 1906 successfully cemented the first well, 4 Hill. At the dedication ceremonies, Paul Andrews of Signal Oil & Gas Co., Los Angeles, and historian for the Pioneers, will relate details of Hill's pioneering.

Allotments Will Be Honored

WASHINGTON.—Oil and gas operators were assured last week that they will be able to cash all third-quarter allotments of controlled materials for operations in the United States, Canada, and abroad.

Directions to the M-46 and M-46A orders issued by the National Production Authority instructed mills to accept authorized controlled-material orders for oil-country tubular goods placed under a third-quarter allotment for delivery at any time up to December 31.

The only requirement upon oil and gas operators is that such orders for casing, tubing, and drill pipe be placed pursuant to lead-time requirements.

Exports at Record Level

WASHINGTON.—Exports of major oil products averaged 335,200 bbl. daily during the week ended August 1, a record high for the year to date and 119,500 bbl. daily greater than during the preceding week.

The weekly report from the Petroleum Administration for Defense showed that shipments increased for all products except distillate.

Details of the week's movement, compared with the preceding week, and averages for the 4 weeks ended August 1, are shown in the accompanying table in thousands of barrels daily.

	—Week ended—		4 weeks
	Aug. 1	July 25	Aug. 1
Aviation gasoline	67.8	25.8	40.7
Motor gasoline	32.4	2.6	16.5
Kerosine	41.8	12.5	18.0
Distillate	105.5	134.1	92.9
Residual	87.7	40.7	66.5
Total	335.2	215.7	234.6

Delivery Restrictions Off

WASHINGTON. — Strike-necessitated restrictions on deliveries of casing and tubing by steel distributors have been lifted by the National Production Authority.

The action was taken at the request of the Petroleum Administration for Defense, which reported that the movement of oil-country tubular goods has been resumed in considerable volume.

The effect is to permit deliveries of casing and tubing from field warehouse set-aside stocks to enable oil and gas operators who drill not more than 20 wells a year to carry out their regular drilling operations.

WATCHING WASHINGTON

Bertram F. Linz

Puncture-Proof Tariff

If the domestic oil producers ever believed they would get higher import taxes on foreign petroleum through application of the escape clauses of the present Reciprocal Trade Agreements Act, their optimism must have been greatly dimmed by recent developments.

Within the past few weeks, President Truman twice has nullified efforts of the Tariff Commission to provide relief for American producers through increased duties.

The relief provisions of the act give the commission authority to investigate the complaints of domestic producers, and where they are found to be well based, to recommend increases in duty to the President. As the oil industry knows, a practically air-tight case must be presented before the commission will undertake an inquiry. When it goes so far as to recommend an increase in duties, it is pretty evident that an increase is needed.

But, under the act, the President is not required to accept the commission's recommendations, provided only that in such instances he report to Congress the reasons for his decision. Taking advantage of this escape from the escape clause, the President rejected an increase in duty on garlic in July and last month turned down a similar recommendation on Swiss watches.

In both instances, Truman rejected findings that the domestic industry was being adversely affected by imports, even though the figures showed that output was declining and unemployment was increasing.

And, he intimated, the administration believes the necessity to make foreign countries prosperous transcends the interests of domestic producers.

If the garlic growers can't grow garlic they can grow something else, he said in effect.

Our Biggest Landowner

The federal Government today owns close to 25 per cent of all the land in the United States and is still adding to its holdings.

In figures, that means the government owns 455,146,726 of the nation's 1,905,361,920 acres, about 10 per cent of it acquired during the Roosevelt-Truman administration. That does not include the Continental Shelf beyond the 3-mile limit nor the coastal belt of "tidelands" which the government claims.

The government's holdings range from gold-plated property in the heart of our largest cities to desert lands known at the moment to be good only for atom-bomb tests, and includes lands highly valuable for oil, potash, minerals, and other deposits.

Going through the list of oil states, here are some interesting figures: Government land holdings comprise 3.36 per cent of Alabama, 8.98 per cent of Arkansas, 45.74 per cent of California, and 37.35 per cent of Colorado. In other states, percentages are as follows: Florida, 8.21; Illinois, 1.25; Indiana, 1.45; Kansas, 0.61; Kentucky, 3.69; Louisiana, 3.64; Michigan, 7.42; Mississippi, 4.89; Missouri, 3.70; Montana, 36.54; Nebraska, 1.50; New Mexico, 45.62; New York, 1.17; Ohio, 0.98; Oklahoma, 8.78; Pennsylvania, 2.05; Tennessee, 6.13; Texas, 1.33; Utah, 71.33; Virginia, 8.14; West Virginia, 8.36; Wyoming, 51.61.

More and More Cars

The Bureau of Public Roads estimated there will be 53,363,000 motor vehicles registered this year to run on 1935 highways which each month become more inadequate.

There will be close to 1,450,000 more vehicles on the road at the end of this year than there were at the close of 1951 and 1,211,400 of them will be automobiles. The rate of increase this year, however, will be only half what it was in 1951 and about one-fourth of previous postwar annual gains.

Some new records are expected to be established this year. California will be the first state to report more than 5,000,000 registrations. New York will probably pass the 4,000,000 mark. Pennsylvania and Texas already have more than 3,000,000 vehicles and Ohio will join them this year.

G. MARRA, nearest Magdalena River port to Totumal.

MOUNTAIN ROAD leading from Totumal to Ocana.

LATIN AMERICA

Totumal Evaluation

Third and fourth wells now drilling; discovery was a big producer, but No. 2 producing only 75 bbl. daily

Dahl M. Duff

THE International Petroleum Co. (Colombia), Ltd., is now drilling the third and fourth wells in the Totumal area, which it discovered in Colombia last year only 3 months after it relinquished its major property, De Mares, to the government on expiration of the concession term.

The promising Totumal area has attracted widespread attention and is still being followed with interest despite the somewhat disappointing results of the No. 2 well, which the company reported a producer of about 75 bbl. daily.

The No. 1 well, which was located on the other side of a regional fault, made 1,100 bbl. daily of 25°-gravity crude at a depth of 7,217 ft. The oil is from the Cretaceous which is elsewhere productive in Colombia only in the Barco concession on the Venezuelan border.

Early in August, the third well, No. 142-3, was diamond coring near 8,000 ft. and preparing to test. No. 142-4 was reported drilling below 5,300 ft.

International's total concession in this particular area cover some 500,000 acres. The area is in the mid-Magdalena Valley about 5 miles north of the former DeMares concession which International of Colombia's predecessor company, Tropical Oil Co., operated for 30 years. The Totumal discovery is about 10 miles east of the Andian pipe line and about 25 miles south of the SAGOC line to the Caribbean.

SECOND TOTUMAL well drilling. Photos by Standard Oil Co. (N. J.).

Pipe-Line Financing Sought

Santiago Trujillo, manager of Empresa Colombiana de Petroleos, is scheduled to arrive in the United States the latter part of August in connection with financing the projected 8-in. products pipe line from Barrancabermeja to Puerto Salgar in Colombia.

The project involves a new 65-mile, 8-in. line from Barrancabermeja to Cantimplora and then 87 miles to Puerto Salgar. Williams Brothers has the contract for the entire $5,000,000 job, according to reports from Bogota.

Barrancabermeja is the location of the only large refinery in Colombia, now being operated by International Petroleum Co., Ltd., under contract with the empresa. Bogota is the Magdalena River terminal of the newly completed products line to Bogota.

The Barrancabermeja - Salgar line is one of several pipe-line projects actively under consideration in Colombia. A line from La Dorada to Manizales and Cartago is now the subject of engineering studies. Another is the proposed line from Barrancabermeja to Bucaramanga. Also under consideration is a crude line branching from the Andian National trunk at Calamar to supply the proposed topping plant at Barranquilla.

In view of the present activity in pipe-line construction and planning, R. Noguera, minister of mines and petroleum, is now studying a decree law which would deal with construction and operation of the lines.

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Nalco Antifoams are the chemicals which can bring you this modern economy. They are fed directly into feedwater or boilers with other water treatment compounds, or independently, in dosages of *only 5 to 8 parts per million!*

The use of Nalco Antifoams has consistently enabled boiler operators to double, triple or even quadruple previous concentration limits . . . and at the same time produce cleaner steam.

Tests in an operating 70,000 lb./hr. boiler (see water analysis below), with 8 p.p.m. Nalco antifoam, failed to produce carryover when dissolved solids concentration *exceeded 25,000 p.p.m.!*

If your antifoam performance is less than you can get with Nalco Antifoams, act now to cut operating costs.

TEST BOILER WATER ANALYSIS at beginning of no-blowdown run, in p.p.m.: H-O, P-720, M.O.-750, Cl-900, SO_4-1420, PO_4-40, DS-3350, S.S.-Trace.

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THE *Nalco* SYSTEM

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Big Mexican Find

Pemex says Tenixtepec 2 flowing 5,000 bbl. daily

PETROLEOS MEXICANOS has completed its Tenixtepec 2 in the State of Veracruz for what it terms as probably "the most important oil discovery in Mexico in nearly a quarter-century."

Sen. Antonio J. Bermudez, director general of the Mexican Government oil agency, said the well came in producing more than 5,000 bbl. daily through a ¾-in. choke. Production at open flow was estimated by Pemex to be from 40,000 to 50,000 bbl. daily.

The new producer is located between the old Golden Lane trend and Poza Rica field, currently Mexico's largest producing field. Size of the field cannot yet be estimated with the information at hand, Pemex said, but it is thought that the discovery will prove to be an extension of the Golden Lane.

The well was completed at 5,235 ft. An 8-ft. interval from 5,226-34 ft. now is being tested.

Confirmation attempts . . . Tenixtepec 2 is about 1,660 ft. to the northeast of the first well, which was brought in as a gas producer. A third well already is being drilled, and a rig is being moved to location for a fourth. Pemex has set up a development schedule calling for the drilling of three wells per month in the field.

The government oil agency now is bringing in 12-in. pipe to hook up the new production with the pipe line from Poza Rica to Mexico City. The gathering line is scheduled to be completed within a month.

Pemex said the new field would be known from now on as Ezequiel Ordonez field, after the geologist who found the first production 50 years ago for E. L. Doheny, pioneer American wildcatter, and who, several years later, found the Golden Lane.

AFRICA

Egypt Signs Over Concession

The Egyptian Government has given the former concession rights in Egypt of Standard Oil Co. (N.J.), to a company identified as Soc. Cooperative des Petroles.

Reports from Cairo said that Soc. Cooperative des Petroles hoped to receive a government permit to operate the Wadi Feiran tract. Jersey discovered production in this Sinai Peninsula well in January 1949.

MIDDLE EAST

New Settlement Plan

Joint British-American proposal said to offer sweeping concessions to settle Iranian dispute, block Communists

A JOINT British-American plan to break the prolonged stalemate in Iran was handed to Prime Minister Mossadegh last week, as Iranian officials escorted W. Alton Jones, president of Cities Service Co., on a tour of the nationalized oil properties.

The two developments apparently were unrelated.

The American and British ambassadors in Teheran visited Prime Minister Mossadegh and presented what was reported to be a plan under which the United States would make substantial credits available to the shaky Iranian economy, and the British would let up in its campaign against export sales by the National Oil Co.

Great secrecy shrouded the proposals presented by the two diplomats. Unofficial reports indicated Iran would be allowed to sell approximately 12,000,000 bbl. of products piled up at Abadan. These concessions in Iran, considered necessary to meet the Communist menace, would provide a "favorable atmosphere" for new negotiations.

Presence confirmed . . . An official Iranian Government statement confirmed Jones' presence in the Iranian capital. The State Department in Washington and the British Government said Jones did not represent a mission from either government.

The announcements indicated Jones was visiting Iran in an individual capacity to determine what will be required to resume operations and possibly to act as a mediator between the Iranian and British governments in the dispute.

The Iranian statement issued in Teheran said:

"William Alton Jones, president of the Cities Service Co. of the United States, who is one of the prominent American industrialists and personalities, accompanied by experts, has come to Iran at the invitation of the premier to study the nature of any assistance which may be rendered to renew the operations of the Iranian nationalized oil industry and also to give any guidance regarding the administration and operation of the oil industry. These gentlemen will visit Abadan to inspect the refinery and the oil fields."

In New York, Cities Service's executive vice president, Burl S. Watson, said in a formal statement that Jones had left New York earlier the previous week for an extended combination business and vacation trip to Europe and the Middle East and that any statement on his discussions with the Iranians would have to come from the Iranian Government. He pointed out that Cities Service has no financial or other interests in the Middle East.

Excitement in Teheran . . . In Teheran, great precautions had been taken to conceal Jones' visit. The presence, but not the identity of his party, in Iran had been known, and Teheran newspapers for several days excitedly speculated on this new group. Some Iranian officials said they hoped the result of Jones' trip would be a resumption of export sales of Iranian oil with Cities Service among the customers.

The Cities Service head was said to be accompanied by four petroleum experts. Though unidentified, it was presumed not all of them were from Cities Service. It was understood the invitation for Jones' trip was made by Prime Minister Mossadegh last fall when he visited the United States to appear before the United Nations Security Council when it argued the British complaint against Iran.

British drafting note . . . Jones' visit comes at a time when the British Government is preparing to make another approach to the Iranian Government for new negotiations on a settlement. The British Government is preparing to reply to an earlier Iranian note, and it is widely reported the British will now make important concessions to the Iranian position. Reports from London indicated the British hoped nothing done by Jones would interfere with these prospects.

Jones, who is 61 years old, served as chairman of the board of the American Petroleum Institute in 1950 and 1951. He is widely respected as one of the industry's outstanding executives and during the war was called in by the government to handle the construction of the Big and Little Inch oil lines. He has been president of Cities Service since 1940 when he succeeded the late Henry L. Doherty.

Jones' position . . . Industry circles last week were recalling Jones' position following the expropriation of the Mexican oil industry in 1938. In 1948 Cities Service contracted with Petroleos Mexicanos to supply technical assistance and financial assistance for the exploration of former Cities Service acreage. After the Mexican expropriation, Jones commented. "Mexico has as much right to enact laws as we have. Don't fight them. Lend them a hand."

Cities Service only foreign interests at present are in Canada. The company has been actively seeking concessions in Venezuela and last fall filed on 450,000 acres in the Maracaibo Basin.

EUROPE

Light-Oil Strike

Discovery made in West Germany's Suderbruch field

ONE of the lightest crudes thus far found in Germany has been discovered in Well No. 48 in the Suderbruch field in West Germany.

The well found oil in the Posidonia shale horizon at a depth of about 2,330 m. (7,800 ft.). On production test, the well flowed 60 cu. m. (about 378 bbl.) daily through a 4-mm. choke. The crude has a specific gravity of 0.839, equivalent to about 37° A.P.I.

Suderbruch field is jointly owned by Deutsche Vacuum Oel, A.G., and Gewerkschaft Brigitta (Jersey Standard and Shell). It had been planned originally to take the well to the Rhaetic sandstone, but a heavy oil and gas blow was encountered at 2,373 m.

Other recent exploration developments in West Germany include:

. . . Reports of a promising oil discovery at Wolfskehlen near Darmstadt have been shown to be premature. Only slight oil traces were found in the mud of Wolfskehlen 4 at from 800 to 900 m., and drilling continues. Results in the 2 and 3 wells were negative.

. . . Boostedt 1 near Neumuenster has been placed on production through a 4-km. pipe line to the railway at Klein-Kummerfeld. The well is producing about 35 tons (about 254 bbl.) daily through a 4-mm. choke. Gravity is 0.87, or about 31°, A.P.I.

. . . Cremine 2 of Gewerkschaft Hanover-Erdoel in Eddesse-Nord field has been placed on production after water in the lower part of the horizon was plugged off. Production is averaging about 10 tons, or about 75 bbl., of light oil daily.

FAR EAST

Dhulian Deep Oil

Attock hits promising pay in Pakistan's Punjab area

THE Attock Oil Co., Ltd., has brought into production a new deeper horizon in Dhulian field in the Punjab region of Pakistan.

The company now has two wells completed in the deeper formation, and a third is being rigged up, according to the recent annual statement of T. T. McCreath, company chairman.

The deepening of one of the older Dhulian wells was undertaken as a result of information obtained from deep drilling in nearby Balkassar field, and production was obtained at 8,260 ft., about 600 ft. below the former main producing horizon.

The third deeper well in the field is located toward the edge of the field, about 8 miles from the first two, and should indicate the extent of the new oil-producing area.

Dhulian revival . . . McCreath said it is not possible to assess the full significance of the discovery, but it promises to bring Dhulian field back as an important producer. The crude is lighter than any so far produced in the Punjab and is flowing under back pressure at more than 600 bbl. daily.

If it can be shown that water-free oil extends over a large area in the new producing zone at Dhulian, the company will be faced with a considerable capital expenditure, chiefly on pipe line and increased tankage, to handle and move the increased production, McCreath commented.

Joya Mair active . . . Reporting on the other fields, the chairman said Joya Mair was being drawn on to meet market requirements for its heavy bituminous crude. Production at Khaur continues at a low figure since no new production was obtained from the deep well, and at Balkassar, output was controlled at an optimum level at slightly reduced pressures.

These Punjab fields are operated under Pakistan's old petroleum regulations, while new exploratory operations come under the country's later 1949 petroleum rules. Attock Oil recently organized a subsidiary, Pakistan Oilfields, Ltd., which is carrying out other exploration. At Bains, Pakistan Oilfields drilled to 3,599 ft. and is trying to overcome mechanical difficulties encountered at that depth. A test at Dhariala is to commence shortly, while structure testing is proceeding at a third area.

B.O.C. Program

Two wildcats, eight field wells on tap in Far East

THE current program of the Burmah Oil Co., Ltd., organization calls for the completion of two wildcats in Pakistan the last half of this year along with about eight field wells in its producing areas of Pakistan, India, and Burma.

During the first 6 months, B.O.C. operating subsidiaries completed one wildcat in India and one in Pakistan. Field wells totaled seven in India, and one each in Burma and Pakistan. The field wells scheduled during the last half are five in India, one in Pakistan, and three in Burma.

B.O.C. operates in India through Assam Oil Co., Ltd., which produces Digboi field in Assam. Output for 1952 is estimated at about 6,000 bbl. daily. Wells in the field include 20 flowing, 200 pumping, and about 350 on gas lift. Four rigs are running. The Digboi refinery has a capacity of 5,750 bbl. daily.

Balkassar output . . . Burmah Oil Co. (Pakistan Concessions) Ltd., expect to produce about 1,300 bbl. daily this year at Balkassar field in the Punjab. The company now has one flowing and three shut-in wells for this 8,000-ft. production, with one rig active.

Burmah Oil Co. (Burma Concessions) Ltd., is using 54 pumping wells in Chauk and Langwa to meet production requirements.

Pakistan Refinery Studied

The report of a technical commission representing Burmah Oil Co., Ltd., on the practicability of building a refinery at Karachi, Pakistan, has been presented to the Pakistan Government.

The report considers the proposal in detail and examines the several possible sites. The Pakistan minister of industries said the report will be carefully studied by the government and that a decision in principle would be taken. The study by the company commission followed B.O.C.'s offer to build a West Pakistan refinery after the visit of W. E. V. Abraham to Karachi last March.

Oil's Economic Outlook

There are plenty of problems facing the industry here and abroad, requiring many adjustments, but they will be met

C. J. Bauer

IN 1951 world oil consumption (outside Russia) is estimated to have reached about 11.3 million barrels per day. That was well over 4 billion barrels per annum.

It was the second consecutive year in which the incremental growth has been over 1 million barrels per day. The upsurge in demand, coupled with the elimination of Iranian supplies in the last half of 1951, called for all-out supply and transportation operations.

Since 1946 world oil demands have increased 4.1 million barrels per day—2.1 million in the United States and almost 2 million in the areas abroad.

Total new capital expenditures in the postwar period will probably gross $25 billion by the end of 1952. From whatever angle the oil industry is viewed, large numbers come into sharp focus.

Obstacles overcome . . . The very substantial progress made in the postwar period was not achieved without many economic, political, and petroleum-supply problems.

A couple of years ago it was thought the industry was building some spare capacity, but that happy thought was quickly dissipated with the outbreak of events in Korea. Last year developments caused by the Iranian oil shutdown soon ate into what little potential spare capacity that was left.

Perhaps the big surprise of the year was that, despite this serious loss, world-wide requirements of oil were essentially met. Rapid expansion of crude production in other countries more than made up for the lost crude supplies, while increased product exports from the United States and decreased imports of foreign oil by the United States released further supplies for use abroad. Under emergency measures, many foreign refineries were pushed above their normal capacities.

The currency problems which had plagued international oil operations in the immediate postwar period, and which were thought to be under control by 1950, again reappeared in 1951.

Earlier this year the statistical position of the United States oil industry appeared to be in reasonable balance when it was hit by a strike in most of the larger refining centers. This action reversed the comfortable stock position of early spring, and the domestic oil industry is now confronted with many operational problems.

As we look down the road, the path is certainly not smooth. The warning pennant seems to read, "Keep a Sharp Lookout." One wonders if the unsatiated post-World War II and post-Korean demands have now been met, thereby bringing to an end one of the greatest booms ever experienced by the petroleum industry.

This analysis will stress the quantitative postwar developments outside the United States, and some of the foreseeable future problems in both the domestic and foreign industries. Experience has shown that quantitative estimates 4 to 5 years into the future have become outdated rather rapidly with changing world economic and political conditions.

Immediate domestic problems . . . Reviewing the short-term period, the industry entered its current summer season of peak gasoline demand with product inventories in the United States severely depleted as a result of the recent refinery strike.

This development poses several supply problems of immediate importance for the period ahead. These include:

. . . **Meeting current gasoline demands,** including the seasonal peak, while improving inventories of the product to more comfortable working levels.

. . . **Maintaining a high production** of middle distillates in order to permit as great a contribution as possible toward the required summer fill for next winter's needs.

. . . **Maintaining runs to stills** at very high percentages of capacity, from now through next winter, in order to accomplish the required production of gasoline and middle distillates.

. . . **Maintaining crude-oil production** rates at levels which will allow for necessary correction in the excessive crude-oil inventory position. This, in turn, might provide some space for storage of residual fuel oil which appears to be accumulating as a result of expanding refinery operations, coupled with slack demand for the product.

. . . **Holding residual fuel oil stocks** to workable levels. If sufficient interchangeability between crude and residual storage capacity proves to be unattainable, residual inventories, already burdensome, may necessitate further cutbacks in crude runs and imports.

The record clearly shows that the oil industry has ever been alert to its supply obligation to the consumer of its products and has adjusted operations to fulfill that responsibility, often regardless of cost. That the past record will be continued seems to this writer to be a foregone conclusion.

Longer-term problems . . . There are quite a few economists who think that within the next few years we might witness a turndown in business activity in the United States. The impact of such a development would be felt by the oil industry.

The annual average postwar rate of gain in the United States' domestic demand has been about 1 per cent higher than for the similar prewar period. The annual average volumetric increment, however, has been about 200,000 bbl. per day more.

A study of the trends in industrial activities in the United States and in oil demands reveals that the trends in business activity have a definite influence in the year to year changes in oil demand. These studies show that it has required a drop of at least 10 per cent in industrial activity to stop the growth of oil consumption in any given year. This, of course, is an oversimplification, and its value lies principally in pointing out the order of magnitude of economic effects.

Product trends . . . There is no substitute for careful end-use analysis to detect individual product trends, the degree of saturation of particular markets, or the competitive effects of alternative forms of energy.

About the Author

C. J. Bauer began his oil career with the New York office of Carter Oil Co. soon after he left the Armed Forces early in 1919. When the Foreign Producing Department of Standard Oil Co. (N.J.) was organized early in 1921 he became associated with that department and for the past 30 years has been specializing in the foreign activities of the oil industry. At present he is head of the Foreign Industry Economics Group of the Coordination and Economics Department of the Jersey Company.

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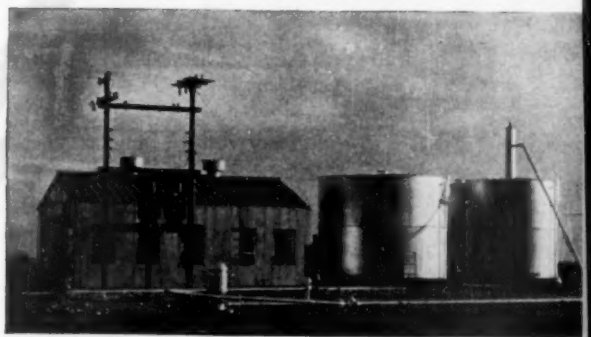


This type of analysis discloses a possible turning point in the historical growth rate of middle distillate consumption. Over the past 15 years, middle distillate consumption in the United States has grown better than 9 per cent per year with little interruption.

This growth rate might continue for another few years, and thereafter could very easily fall to only half. This change could be brought about by three principal factors:

... **The railroad diesel market** will be approaching saturation.

... **A possible decline** in economic activity and its impact on new housing could affect the market for home heating oil.

... **Substantial volumes** of natural gas will be cutting into the house heating market while the smaller number of coal-heated homes will become more resistant to oil conversion.

Thus the two main elements in the large distillate increases which have been experienced in the past will drop to the level of growth of most of the other major products. Heating oils and railroad diesel oils currently account for two-thirds of the middle distillate demand.

It is possible that some new uses for distillates may develop to help sustain past growth rates but there are few signs of such uses at the moment and it is doubtful that these, including jet fuel, could reach significant volumes in the next 3 to 4 years.

Looking ahead at demands for residual fuel oil, if little further gain in the level of business activity can be foreseen and continued losses due to railroad dieselization as well as increased natural gas supplies can also be foreseen, then a levelling in the demand for residual fuel oil can be predicted.

United States refiners are still going ahead with the installation of new fuel-reduction facilities so that domestic supplies of residual fuel oil show prospect of little additional volume. Furthermore, with somewhat similar refining trends taking place abroad in the face of relatively strong growth in foreign residual-fuel requirements, it would be safe to assume that only minor increases in residual-fuel imports into the United States can be expected.

Foreign Oil Industry

The data in this section will cover the foreign areas, excluding Russia, but including the so-called Russian satellite countries.

The rationed demand for this latter group is thought to be in the neighborhood of 140,000 bbl. per day. Supplies amount to about 180,000 bbl. per day. Regarding Russia, it is thought that area had about 870,000 bbl. per day of crude-oil and other light-hydrocarbon supplies available in 1951.

Thus, the combined areas had a little over 1 million barrels per day to satisfy strictly rationed civilian needs, military, and other governmental demands, and for stockpiling requirements. On a per capita basis (including China), the 750 million people of Russia and its satellites had available for use less than ½ bbl. per person.

Product demand ... One of the outstanding surprises in the postwar period has been the continued strength of the growth in demands for all oil products abroad.

In the past 2 years the volumteric growth has been about 1 million barrels per day, or about half the overall growth of the past 5 years. Moreover, the 5-year growth was about equal to the aggregate gains made from the beginning of the industry. A summary of the postwar situation is shown in Table 1.

The average annual volumetric increment in the foreign circuit has amounted to nearly 400,000 bbl. per day or nearly four times greater than the growth in the 5 prewar years. The annual average percentage rate of gain of 13.4 per cent is more than twice the prewar rate. The average volumetric postwar gains in foreign areas were only slightly below the gains made by the United States oil industry in the same period. Percentage-wise, it was far greater.

The long-term foreign growth rate has been about 6.4 per cent per annum. If the war had not interrupted this normal trend, 1946 demand would have been about 1 million barrels per day higher than was actual experience. Thus, despite the rapid postwar rise in demands, this lost growth has not been fully recovered.

Current conditions suggest that the postwar boom abroad has abated and the more normal prewar growth rates can be expected in the years ahead. However, this more normal rate of growth—6.5 per cent—compounded on last year's peak local demands would indicate a foreign requirement for crude and products of about 5.5 million barrels per day by 1955. This would be about 1.2 million barrels per day more than was needed in the year 1951.

In other words, the foreign growth of crude and product demand in the next 4 years might be only slightly higher than the combined increments experienced in the past 2 years.

Foreign product growth ... Table 2 is an estimate of demand for major products—1946 vs. 1951. The United States and world totals are given in this table to show the weight of foreign demands in such a comparison.

... **Foreign gasoline demand** includes about 75,000 bbl. per day aviation gasoline for 1951. Last year for the first time the use of gasoline abroad averaged over 1 million barrels per day.

While the volumetric gain in the postwar period has been about half that of the United States, the percentage growth has been higher. About 70 per cent of the foreign demand for gasoline originates in the foreign Western Hemisphere section and in Free Europe. Except for Canada, automotive gasoline is not extensively used for private motoring. The most substantial

TABLE 1—DEMAND GROWTH ABROAD
(Thousands of barrels daily)

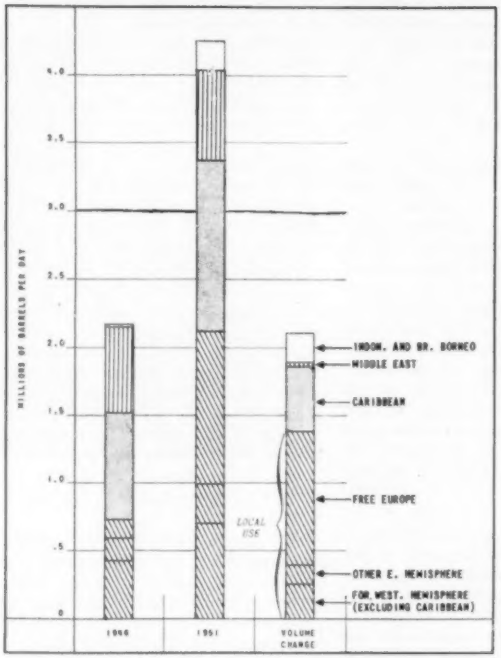
	Local demand	Volume increase	Per cent increase	Supplies	Net exports	Stock change	Refinery runs
1946	2,260			2,370	10	+100	2,156
1947	2,688	428	18.9	2,696	16	— 8	2,484
1948	2,947	259	9.6	3,264	172	+145	2,880
1949	3,264	317	10.8	3,659	338	+ 57	3,189
1950	3,699	435	13.3	4,323	552	+ 72	3,781
1951	4,245	546	14.8	4,850	435	+170	4,261
Average annual postwar 5-year growth	397.0		13.4	496.0			421.0
Average annual prewar 5-year growth	107.4		6.4	94.6			97.4

TABLE 2—WORLD DEMAND FOR MAJOR PETROLEUM PRODUCTS*
(Thousands of barrels daily)

	1946	1951	Increases 1951 vs. 1946 Vol.	Per cent
Gasoline—				
Foreign	636	1,124	488	76.7
United States	2,015	2,981	966	47.9
World	2,651	4,105	1,454	54.8
Middle distillate—				
Foreign	519	1,052	533	102.7
United States	909	1,563	654	71.9
World	1,428	2,615	1,187	83.1
Residual fuel—				
Foreign	860	1,676	816	94.9
United States	1,316	1,545	229	17.4
World	2,176	3,221	1,045	48.0

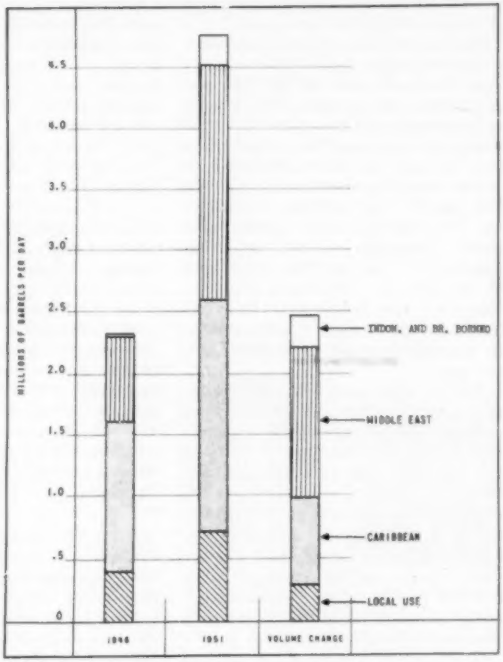
*Excludes Russia.

Foreign Refinery Runs



REFINERY RUNS, excluding the United States and Russia. Figures on which the chart is based appear below. The "local-use" designation applies to the areas in which the refineries are run to supply indigenous requirements.

Foreign Crude Production



CRUDE-OIL PRODUCTION, excluding the United States and Russia. In this chart the "local use" section was not broken down by areas because the gain in this section was not significant when compared with the increases in the principal crude-exporting areas.

FOREIGN REFINERY RUNS (EXCLUDING RUSSIA)
(Figures in thousands of barrels daily)

	Year 1946	Year 1951	Vol. change
Indonesia and British Borneo	3	213	210
Middle East	641	668	27
Caribbean	774	1,260	486
Free Europe*	145	1,122	977
Other Eastern Hemisphere*	161	296	135
Foreign Western Hemisphere*	432	702	270
*Local use.			
Total	2,156	4,261	2,105

FOREIGN CRUDE-OIL PRODUCTION (EXCLUDING RUSSIA)
(Figures in thousands of barrels daily)

	Year 1946	Year 1951	Vol. change
Indonesia and British Borneo	12	258	246
Middle East	700	1,924	1,224
Caribbean	1,180	1,867	687
Local use	428	724	296
Total	2,320	4,773	2,453

part of the use, outside of Canada, is for commercial purposes.

. . . Middle distillate demands in the foreign circuit also climbed above the million-barrels per day mark for the first time.

Outside of Canada, the use of middle distillates for home heating is not important. Some gains have been made in this use in Europe but, on balance, it can be said that the home heating markets abroad have been barely scratched.

The principal uses for the middle-of-the-barrel product are for industrial purposes, military jet use, dieselized road and water transportation, and as a lighting and cooking fuel in some of the lesser developed areas. Volumetrically, middle distillate demands in the postwar period have just doubled.

. . . Residual fuel oil consumption abroad, as shown in the table, for the first time exceeded that of the United States. About 90 per cent of the volumetric growth in the regions outside of the United States can be attributed to the increased land-trade segment. Residual fuel oil for international bunkers is an important piece of the foreign demand, reaching about ½ million barrels per day or 30 per cent of the total residual-fuel-oil consumption last year.

Coal shortages in Europe have been a strong stimulant to the increase in the use of residual fuel oil in that part of the world.

Refinery runs . . . In addition to abnormal growth in foreign domestic requirements, the United States has become a net importer of substantial volumes of oil in the postwar period. The combined increase in demand and net import requirements for the United States resulted in a sharp gain in foreign refinery operations in the postwar period.

As shown on the first of the accompanying charts, runs have just about doubled during this period. Over 60 per cent of the refinery expansion has taken place in the areas where the operations are primarily for local use. Nearly a million barrels per day of the operations in this local use category occurred in Free Europe. In 1946 operations were low because of the terrific damage which occurred to the plants

during the war. However, the most significant part of the nearly 1 million barrels per day increase has occurred in the construction of new plants.

France led the parade. Expansion of refinery operations in that country have increased over 300,000 bbl. per day in the past 5 years. The French refinery-expansion program is practically all completed. The United Kingdom was not far behind France with an expansion in runs of nearly 300,000 bbl. per day. In the United Kingdom, however, several new plants now under construction will be completed within the next few years, and by that time its refineries will have a capacity to run about 570,000 bbl. per day while the French capacity will be in the neighborhood of 460,000 bbl. per day.

In the refineries in the surplus export areas, runs have increased a little over 700,000 bbl. per day in the postwar period. Of this, nearly 500,000 bbl. per day has occurred in the Caribbean area. Venezuela has accounted for about 50 per cent of the increased refining activity in the Caribbean area. The gain in Middle East refinery operations is somewhat distorted in this picture because of the loss of about 250,000 bbl. per day of runs in Abadan in 1951.

Problems because of Abadan . . . The loss of Abadan caused the refineries in other parts of the Eastern Hemisphere to operate at much higher rates in 1951, some even in excess of designed capacity. The shutting-in of Abadan also forced the Caribbean refineries to run at peak levels throughout the last half of 1951.

One of the big surprises in last year's operations was the ability of the oil industry to meet virtually all demands for petroleum products, despite the fact that the world's largest refinery was shut down for 6 months of the year.

The two most critical products lost by the shutting-in of Abadan were aviation gasoline, because of its limited production elsewhere abroad, and residual fuel oil, because of the large volumes involved. About 30 per cent of the total refined-products supply of Abadan was used within the Middle East; a large part was for industry operations and ship's bunkers. The Free European and Far Eastern markets were also principal recipients of Iranian products supplies. Between them, these two areas took over 50 per cent of the output.

The major part of the refinery load thrown on other areas because of the cessation of operations in Abadan were picked up by the refineries in Free Europe, the Caribbean area and to some extent the United States.

A review of the probable refinery capacities in foreign areas, after giving due consideration to currently announced refinery-expansion programs, suggests that the normal trends of demand can be met, but the foreign refinery situation will be very tight until Abadan returns to operation.

As is well known, many of the refineries in Europe have been operating uneconomically in that they have been using cracking and other facilities for straight distillation purposes to increase output. This uneconomical practice will undoubtedly be discontinued if Abadan returns on stream.

The refineries in the Caribbean area will probably again become vulnerable because of exchange considerations. Therefore, if Abadan returns to full operation of about 450,000 bbl. per day, the refineries in the three areas above mentioned may be required to make downward adjustments of that magnitude.

Yields-pattern changes . . . Another problem will have to be faced by the foreign refinery operators in the years ahead. This is the yield pattern.

In order to meet local foreign demand and probable exports to the United States, the yield pattern in the plants abroad would not have to change very materially from that of 1951.

However, as previously stated, many of the foreign refiners were using cracking facilities for straight distillation purposes to meet extraordinary demands after Abadan was shut down. Considerable cracking facilities have already been installed in the foreign plants, particularly in Europe and more are expected to be placed on stream in the years immediately ahead.

There is every reason to believe that when Abadan is placed back in operation, or as further European capacity is completed, cracking and other refinery equipment will be used for designed purposes.

This appears to be a normal development under the present price structure. It also fits the objective of local refineries to reduce to a minimum the importation of higher-priced fractions. Planned new refinery facilities abroad are not being designed to produce a high enough residual demand to meet expected requirements of this product. If the refiners abroad try to achieve the required incremental middle-distillate yields and, at the same time maximize gasoline output, residual-fuel-oil supplies may fall short of demands.

It is apparent that forces will be present tending to promote overproduction of residual fuel oil. Therefore, changes from present price relations between products may become necessary if balanced operations are to be achieved abroad.

Crude supplies . . . The second chart shows the foreign crude production in the postwar period. Crude output abroad has more than doubled in the past 5 years, increasing nearly 2.5 million barrels per day. The production for local use, unlike the refining situation, increased only about 300,000 bbl. per day in the period, the greatest gain occurring in Canada.

Nearly 90 per cent of the gain in crude-oil supplies took place in the surplus export areas, and well over half of this increment was in the Middle East countries. Crude production in Venezuela showed the largest volumetric gain in the Western Hemisphere, increasing nearly 650,000 bbl. per day in the postwar period. In the Middle East, output in Kuwait and Saudi Arabia together grew over 1.1 million barrels—each sharing about equally.

The figures clearly point to the dominant part the Middle East has played in the postwar crude oil supply picture. Currently, the Middle East is producing over 2 million barrels per day, despite the loss of about 600,000 bbl. per day of Iranian crude supplies.

Looking down the road a way, when Iran comes back into full operation some major adjustments will have to be made in producing operations. Before the nationalization and closing down of the Iranian producing activities, that country had an export market for about 150,000 bbl. per day of crude. Crude supplies today and in the future are more than ample to take care of the expanded needs for raw materials.

It would appear that Iran may have a great deal of difficulty in regaining a position in the world export market for crude oil and, if this should prove to be the case, the producing operations in other areas would have to be adjusted more or less in line with downward arrangements in refinery runs. The over-all effect would probably be to decrease crude output some in Kuwait and Arabia, and also further decrease eastbound transatlantic movements.

Summary . . . That the oil industry will have many problems in the years ahead is a foregone conclusion. However, judging from the outstanding performance displayed during the postwar period, there is every reason to believe the industry will continue to make a creditable showing.

Takes New Post

M. A. Wright assumes new position at Carter Oct. 1

MYRON A. WRIGHT, 41, the newly elected executive vice president of Carter Oil Co., is now in his twentieth year with Standard Oil Co. (N.J.) and its affiliates.

Wright, who also has been elected a company director, will assume his new duties in Tulsa October 1. He has been serving as executive vice president of International Petroleum Co. at Coral Gables, Fla., since August 1951.

He received a degree in civil engineering from Oklahoma A. & M. College, Stillwater, in 1933. Then he began his career as a roustabout for Carter in the Seminole fields of Oklahoma.

He served in various engineering capacities for Carter in Oklahoma and Louisiana before being named chief petroleum engineer in 1943. A year later Wright became assistant manager of the production department.

In 1946 he became executive assistant in the producing coordination department of Standard Oil Co. (N.J.) in New York. He rose to deputy coordinator of world-wide producing activities 3 years later.

Wright is a member of the American Institute of Mining and Metallurgical Engineers and the American Petroleum Institute.

C. H. Keplinger, Tulsa consultant, left August 26 for India, where he will work with Burmah Oil Co. in expanding Burmah's water-flooding projects. Burmah began pressure-maintenance operations in one field about a year ago. His present trip will be to begin secondary-recovery projects in older fields. En route he will extend invitations in London, the Middle East and Calcutta, to the 1953 International Petroleum Exposition in Tulsa, and will attend the International Geological Congress in Algiers.

William Wallace Mein, Jr., Charles W. Fay, and **Louis J. Brunel** constitute the newly formed board of directors of Canadian Bishop Oil Co., the Canadian operating subsidiary of Bishop Oil Co. All are members of the Canadian firm's executive committee. Mein was named president, and Brunel was appointed vice president. Other officers include: **E. J. Valencia,** treasurer and assistant secretary, and **Gardner W. Mein,** secretary. The transfer of assets from the parent company to its subsidiary as a nontaxable transaction has been approved by the U. S. Treasury Department.

Robert A. Anderson, who retired last October as president of the Texas-Mid-Continent Oil & Gas Association, has been elected a director of Southwestern Bell Telephone Co. He is general manager of oil and ranching interests of the W. T. Waggoner estate.

J. S. George has joined Trans Era Oils, Ltd., as vice president of company's B & R Drilling Division, with headquarters in Wichita. The appointment is effective September 1. George, formerly special regional representative for the northern region of Hughes Tool Co., has been with Hughes Tool 18 years.

William Reinhold, geologist for Tide Water Associated Oil Co., has been transferred from Houston to Oklahoma City. **James A. McCarthy,** who has been employed by Core Laboratories, Inc., at Houston, has been appointed assistant geologist for Tide Water at Jackson, Miss. Other company changes include: **William F. Stevens,** head roustabout at Spraberry, transferred to Victoria, Tex., as assistant foreman; **Leon W. Harris,** civil engineer at Houston, resigned; **James F. Eggleston,** foreman at Harvey, La., transferred to Venice La., and **Hubert T. Odom,** head roustabout at Venice, transferred to Harvey as foreman.

Ted Sparling has been named superintendent of the new McElroy-Wilshire gasoline plant in Upton County, Texas, jointly owned by Lone Star Producing Co. and Wilshire Oil Co. Sparling formerly was at Ranger as superintendent of Lone Star's central fractionating plant. **J. O. Simpson,** maintenance foreman for Lone Star's West Texas district, has been appointed assistant superintendent of the McElroy-Wilshire plant.

Kenneth H. Shaffer has been appointed a vice president and director of The California Co., subsidiary of

K. H. SHAFFER

C. W. GIBBS

Standard Oil Co. of California. Succeeding Shaffer as assistant general manager of Standard's producing department is **C. W. Gibbs,** who has been manager of the department's Northern California district since 1950. **W. A. Eardley,** formerly chief petroleum engineer, has been appointed to Gibbs' post in Taft, Calif.

Wilbur S. Mount, manager of product engineering in the gasoline and fuel-oil department of Socony-Vacuum Oil Co., Inc., has been appointed manager of the aviation department. He succeeds **Warren L. Baker,** who has retired.

Frank W. Abrams, chairman of the board of Standard Oil Co. (N.J.), has been elected a trustee of the Industrial Relations Counselors, Inc., a nonprofit organization supported by business to promote advancement of employer-employe relations.

Arthur H. Boultbee, who recently returned from a special assignment in England, has been appointed manager of manufacturing research for Shell Oil Co. He replaces **D. L. Yabroff,** who is returning to Shell's research laboratory at Emeryville, Calif., as an associate director in charge of chemical products. Boultbee, who joined Shell as a chemist at the Martinez refinery in 1935, has served at the refinery at Wilmington, Calif. He

PERSONALS

also has had several assignments with associated companies outside the United States.

C. I. Semler, production foreman for Deep Rock Oil Corp., has been transferred from El Dorado, Kans., to Pratt, Kans.

D. S. Donnelly, assistant Oklahoma district superintendent for The Texas Co. has been promoted to district superintendent, succeeding **R. E. Couch,** who has resigned. **E. R. Filley, Jr.,** has been promoted from district petroleum engineer to assistant Oklahoma district superintendent. **J. H. Moore,** formerly Kansas district petroleum engineer, has been appointed Oklahoma district petroleum engineer. **J. P. Freeman,** petroleum engineer, has been promoted to district petroleum engineer in Kansas.

Ben W. Smith, party chief for Continental Oil Co., has been transferred from Artesia, N. M., to Ozona, Tex.

James Divelbiss, formerly division seismograph superintendent for Sun Oil Co. at Denver, has been appointed chief geophysicist for The Chicago Corp. at Fort Worth.

Irvin M. Glasser, petroleum engineer for Humble Oil & Refining Co. at Kingsville, Tex., has been promoted to district petroleum engineer at Encino, Tex.

E. W. Price has been appointed chief geologist for Kingwood Oil Co. in Oklahoma City.

C. L. Blacksher, district foreman for Skelly Oil Co., has been transferred from Agua Dulce, Tex., to Bay City, Tex.

I. C. Walter, tool pusher for Kerr-McGee Oil Industries, Inc., has been transferred from Billings, Mont., to Red Lodge, Mont.

Zambry P. Giddens, Dallas, has been elected president, director, and a member of the executive committee of Palmer-Stendel Oil Corp.

William Alexander, Jr., formerly assistant resident engineer for General Petroleum Corp. in its San Joaquin Valley division, has been promoted to production engineer in the southern division at Vernon, Calif.

William H. Hommel, geologist for Gulf Oil Corp., has been transferred from Pittsburgh to Oklahoma City.

Edwin Loy Hall, Cleveland, Ohio, director of the testing laboratories of the American Gas Association, will receive the Walton Clark Medal of The Franklin Institute of Pennsylvania October 15 for his contributions to the gas industry. From 1945 to 1947 he was secretary-coordinator of the gas production research committee of the A.G.A., and has been assistant managing director since 1950.

W. P. Adent, geologist for Bankline Oil Co. at Midland, Tex., the past 3 years, has resigned to join the staff of Wm. Ross Cabeen & Associates in the firm's Midland offices.

Sargent Reynolds, consulting geologist, has moved his offices from Taft, Calif., to Woodland, north of Sacramento.

T. L. Tapp, formerly production superintendent for Sorrells Oil Co. at Fort Worth has joined California Texas Oil Co., Ltd., at New York as a petroleum engineer.

Dr. Louis Lykken, assistant head of the analytical department for Shell Development Co. the past 8 years, has been appointed manager of technical service of Julius Hyman & Co., Denver. The company recently was purchased by Shell Oil Co. Dr. Lykken received his Ph.D in physical chemistry from Iowa State College in 1933 and was a member of the faculty there until 1938.

L. C. Stevens, chief petroleum engineer for Socony-Vacuum Exploration Co. in Canada, has been appointed manager of production. **P. A. Taylor,** who recently joined the company, has been named petroleum engineer. Other company appointments include: **Edwin Thurston,** named in charge of drilling operations, and **Ed Barroll,** transferred from Calgary, Alta., to Fosterton, Sask., as field superintendent.

Maxwell G. Capen has been appointed manager of exploration for Kroy Oils, Ltd., Calgary independent firm. For the past 6 years he has been with Seaboard Oil Co. of Delaware.

W. F. Youngblood, toolpusher for Penrod Drilling Co., has been transferred to Silverton, Tex. He formerly was located in Post, Tex., and Ray, N. D.

William E. Lyle, Jr., formerly a student at the University of Oklahoma, Norman, has been hired as a petroleum-engineer trainee for The Texas Co. at Tulsa.

Bruce S. Bacon, who has been with Falcon Seaboard Drilling Co. the past 7 years, has joined Cactus Drilling Co., San Angelo, Tex., as manager of operations.

Millard W. Smith, geologist and land man for Anschutz Drilling Co. at Wichita, has resigned, effective September 1. He formerly was associated with Anderson-Prichard Oil Corp. in Wichita and Oklahoma City for 22 years.

A. L. (Jack) Barnett, Jr., Dallas, independent and partner in the firm of Clardy & Barnett, has been elected a director of Texas Empire Life Insurance Co.

Curtis M. Brownlee, petroleum engineer for General Crude Oil Co., has been transferred from Kountze to Clairemont, Tex.

Jakob Grynberg, formerly a student at Colorado School of Mines, has joined Pennant Drilling Co. at Denver as a production engineer.

Peter A. Blasco has resigned as district representative for Universal Oil Products, Chicago, to join Aurora Gasoline Co., Detroit, as assistant to **L. A. Curran,** general superintendent.

L. L. Helmer, junior exploitation engineer for Shell Oil Co. at Calgary, Alta., has been assigned to a 48-week training program in the United States.

Glen B. White, formerly a chemist for Phillips Petroleum Co., at Odessa, Tex., has been appointed a chemist for Cosden Petroleum Corp. at Big Spring, Tex.

J. L. Ellis has resigned after 15 years in the land department of Skelly Oil Co. to establish offices as an independent in Houston.

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Donald R. Lindsay, exploration engineer for Shell Oil Co., has been transferred from Ventura, Calif., to Casper, Wyo.

R. L. Wheelock, Texas independent operator, has been appointed president and general manager of Devon-Leduc Oils, Ltd. He is a member of the firm of Wheelock & Collins, Corsicana, Tex., and a director of the American Petroleum Institute. He has served two terms as vice president of the institute's division of production.

Jack Sisco, drilling superintendent for Greyhound Drilling Co., Inc., has been transferred from San Angelo, Tex., to Shreveport.

W. C. Eyl, formerly manager for L. C. Young at Morehead, Ky., has joined Sohio Petroleum Co. as a geologist at Grand Forks, N. D.

O. C. Thornton has been transferred by Marimac Oil Co. from Troy, Ind., to Evansville, Ind., where he is general superintendent.

R. H. Elliston has been appointed a research technologist for Skelly Oil Co. at Pawhuska, Okla. He formerly was a chemistry instructor at the University of Illinois.

C. F. Hoffman, chief engineer for United Gas Pipe Line Co., has been transferred from Edna, Tex., to Needville, Tex.

Gifford W. Spaugh, head roustabout for The Texas Co. at Caldwell, Kans., has been promoted to assistant production foreman at Ogallah, Kans.

Frank A. Apgar has resigned as assistant director of the light-oil and petrochemical division of Sinclair Research Laboratories, Inc., Harvey, Ill., to become chemical engineer for the C. W. Nofsinger Co., Kansas City. He was with Sinclair 26 years.

G. S. Taitt has been appointed a director of Shell Co. of Egypt, Ltd., and of four other subsidiaries of Shell's Consolidated Petroleum Co., Ltd. **F. T. Haddock** has been made general manager of these companies. Taitt has served in Shell's world-wide operations since 1928 and from 1943 to 1946 was with Shell Oil Co. in the United States as senior exploitation engineer at Houston and later division manager for Kansas. In December 1950 he became manager of Anglo-Egyptian Oilfields. Haddock joined the group in 1927 and since 1947 has been assistant general marketing manager at Cairo.

G. L. Reid, manager of the Latin American division of Shell's production department in London, has been appointed general manager in Trinidad of the United British Oilfields of Trinidad, Ltd. He has been succeeded as Latin American division manager by **H. L. R. Pickett.**

John Janevy has resigned as district geologist for Tide Water Associated Oil Co. in Oklahoma City to become associated with **L. S. Youngblood** there.

C. H. Broussard and **Curtis P. Harkins** have been named vice presidents of Independent Exploration Co. Each has been with the company 16 years.

Edward W. Keefner, Jr., has joined American Republics Corp. as a geologist in the regional office at Houston.

Bruce Frazee has joined Ohio Oil Co. as geologist at Houston. He is a graduate of the University of Texas.

Ray R. Vincent, formerly assistant superintendent of operations for Sohio Petroleum Co. at Centralia, Ill., has been promoted to superintendent, succeeding **F. J. Rosenleib,** who has been transferred to Pauls Valley, Okla.

Joe McCoy, district geologist for Sinclair Oil & Gas Co. at Casper, Wyo., has been promoted to assistant regional geologist at Denver. **Leonard Mercer,** formerly in the company's district office in Billings, Mont., has been named to succeed McCoy at Casper.

Charles B. Chittim, Casper, Wyo., has been named president and treasurer of Overide Oils, Inc., a newly incorporated company at Casper. Other officers include: **A. Edminston,** San Antonio, Tex., vice president; **G. B. Butterfield,** Billings, Mont., secretary; and **C. S. Porter,** assistant secretary.

Ivan Carvalho, supervisor of drilling services at Bahia for the Brazilian Government organization, Conselho Nacional do Petroleo, is now visiting Texas fields in connection with a 3-month tour of oil operations in the United States.

Clifton S. Corbett, manager of Socony-Vacuum Exploration Co., Calgary, Alta., will be transferred to New York as advisor to the coordinator of domestic production of Socony-Vacuum Oil Co., Inc., the parent firm. **Hiram R. Moorman,** chief geophysicist for Socony-Vacuum, will succeed Corbett at Calgary. **Edward C. Cram** will replace **Dr. Arthur E. Fath,** who recently retired, in following Canadian operations and acting as assistant to the coordinator of domestic production. All the appointments are effective October 1.

DEATHS

L. E. Sloan, 63, district production superintendent for Stanolind Oil & Gas Co., died recently in Abilene, Tex. He had been in the oil business 41 years and had worked in the Burkburnett oil boom and in oil areas of Oklahoma, Kansas, and Texas.

Olney W. Nicewonger, 72, retired civil engineer for Tide Water Associated Oil Co., died in Linden, N. J., August 18 of a heart attack.

Robert Lee Talbert, 66, Orcutt, Calif., retired driller for Union Oil Co., died August 15 in a Long Beach hospital.

Edward Clay Yerby, 41, production engineer for Richfield Oil Co., died August 19 at Long Beach, Calif.

E. L. Chapman, owner of Southland Geophysical Service, died August 19 in Jackson, Miss. He had been an oil operator in Arkansas, Texas, and Louisiana.

Walter S. Gordon, 61, former oil producer in the Clintonville and Kentucky fields, died at his home in Bradford, Pa., August 22.

James M. Lee, 63, formerly a test analyst for Esso Standard Oil Co., in its Bayonne, N. J., refinery, died August 22.

Virgil Gorby, 52, Mount Pleasant, Mich., a driller for Turner Drilling Corp., was killed in a drilling accident in Shelby field, Oceana County, Michigan, August 16.

9,360 Wells Undergo Hydraulic Fracturing

by George C. Howard*
and William G. Bearden*

The most recent development of this process is a new method whereby multiple formation fractures are created in a single treatment.

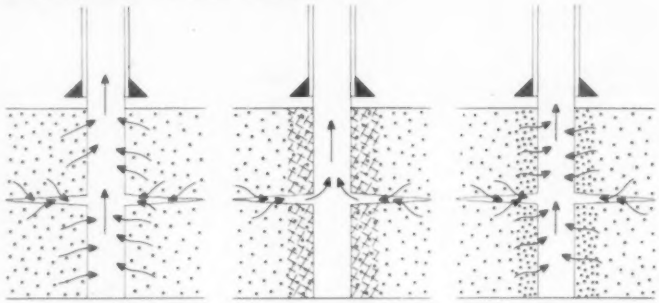
THE field application of the original hydraulic fracturing process (the single-fracture method) indicated that in some instances it was impracticable to treat a given well due to the inability to isolate properly that portion of the producing formation to be treated. Analysis of this problem, plus the need for a method that would create more than one fracture on a single hydraulic fracturing job, led to the development of the new multiple fracturing process.

The rupture phenomena . . . A study of the flow characteristics of the fracturing fluid and the rupture phenomena of rock formations has shown that both the fracturing-fluid viscosity and its ability to penetrate a formation are important considerations in rupturing a formation. The penetration of the treating fluid into the pores of the formation seems to act somewhat as a "hydraulic wedge." Thus in a given section of open hole, where rock strength is uniform, if hydraulic pressure is applied to the bore, failure first occurs where there is greatest penetration of the hydraulic fluid into the rock pores. Conversely, it has been observed that when the fracturing fluid is confined to the well bore, much higher fracturing pressures are required. The effect of confining the fracturing fluid to a bore in a rock core is illustrated in Fig. 1.

The data in Fig. 1 led to the development of a multiple-fracturing technique wherein a single fracture is created and then plugged at its face on the well wall by introducing into the fracturing fluid a suitable plugging material to prevent further penetration of the fracturing fluid into the crack. By so restricting the fracturing fluid to the well bore, it is then possible to increase the hydraulic pressure in the hole to some higher value, at which another fracture occurs at some other elevation where the fluid seal on the well bore is not so complete, or where the rock is markedly weaker than at other depths. Each fracture, so formed, is extended with a viscous liquid containing no plugging material. Thus, by

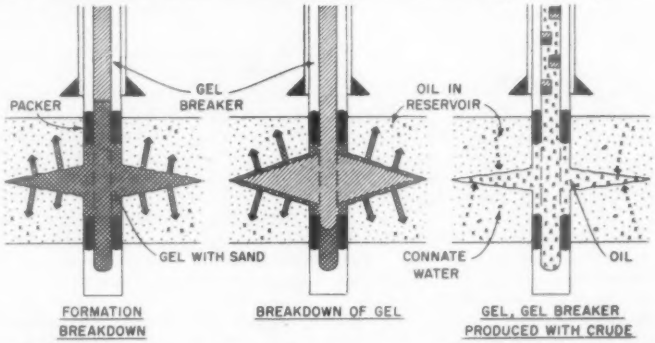
*Stanolind Oil & Gas Co., Tulsa.

1. Why the Process Works . . .



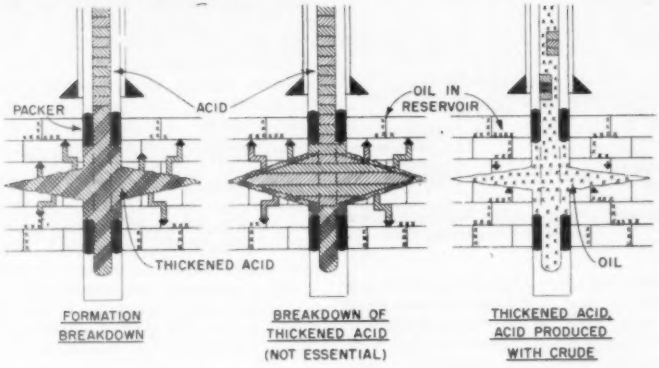
1. THEORY OF OPERATION . . . The process consists of (a) thickening a hydrocarbon, such as crude oil or kerosine, or an acid, (b) adding a quantity of sand to the gel to serve as a propping agent in the fracture, (c) displacing the gel and sand down the tubing and into a producing formation at a sufficient rate to create a fracture, and (d) finally injecting a breaker solution to assist in the reduction of the gel viscosity so it may be flushed from the formation with the well fluids. Thus, the productive ability of the formations is increased by creating cracks or fractures in the reservoir rock.

2. Standard Method of Hydraulic Fracturing (Sand). . .

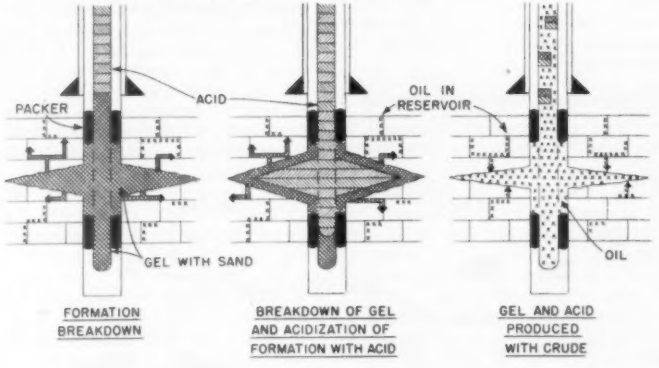


2. STEPS ARE . . . (a) Formation Breakdown.—Inject a viscous low-penetrating hydrocarbon (crude oil or kerosine thickened by typically 5 per cent by weight of napalm) at pressures and rates sufficiently high to fracture the formation. The gel may contain a sand-propping agent to hold fracture open. (b) Reduction in gel viscosity.—Inject a separate gel-breaker solution or incorporate a chemical in the fracturing gel. (c) Place well back on production.

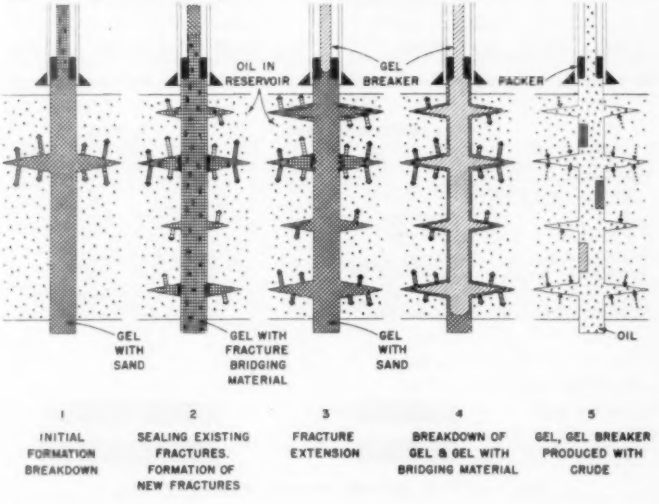
3. Fracturing With Acid . . .



4. Combination Hydrafrac-Acid . . .



5. Multiple Hydraulic Fracturing Method . . .


OIL IN RESERVOIR
GEL BREAKER
PACKER
GEL WITH SAND
GEL WITH FRACTURE BRIDGING MATERIAL
GEL WITH SAND
OIL
1 INITIAL FORMATION BREAKDOWN
2 SEALING EXISTING FRACTURES. FORMATION OF NEW FRACTURES
3 FRACTURE EXTENSION
4 BREAKDOWN OF GEL & GEL WITH BRIDGING MATERIAL
5 GEL, GEL BREAKER PRODUCED WITH CRUDE

repeating this procedure, i.e., sealing successively formed fractures with a suitable plugging material which allows the imposition of sufficient pressure to fracture other portions of the formation, it is possible to create multiple fractures in any one isolated section of the well.

Both sands and limes . . . The napalm gel used as the fracturing fluid for the hydraulic fracturing process in sandstone, and the thickened acid used as the fracturing fluid for the hydraulic fracturing process in high-solubility carbonate rocks both have proved satisfactory as a transporting medium for the plugging material used in this multiple fracturing method. This allows the multiple fracturing method to be adaptable to all types of producing formations and allows it to be used in conjunction with each of the three variations described under the single-fracturing method. That is, by selecting the composition of the transporting and

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3. HIGH-SOLUBILITY CARBONATE ROCKS . . . Inject a thickened hydrochloric acid into formation to cause fracturing. If additional acidization is desired, plain acid may be injected. As of March 1, 1952, 95 wells have been fractured; 65 per cent have shown sustained production increases, a typical treatment resulting in a 200 per cent increase in oil-producing capacity.

4. LOW-SOLUBILITY CARBONATE ROCKS . . . Up to point of fracturing, procedure is identical with "Standard Hydrafrac." Immediately following displacement of gel into tubing, HCl is pumped into well instead of the hydrocarbon-base gel-breaker solution. Thus, a fracture is created, then enlarged by the acid. Results: 25 wells treated, 72 per cent successfully, 180 per cent increase.

5. MULTIFRAC . . . Single-batch version consists of temporarily plugging previously created or existing fractures with a thickened oil or acid containing a suitable temporary plugging material, then creating a new break in the unfractured portion of the well.

Multiple-batch multiple fracturing consists of producing a fracture in the formation by any of the previously described methods, then sealing that fracture by injecting into the well a suitable temporary bridging agent suspended in a carrying medium, followed by a relatively low-penetrating and/or high-viscosity fracturing fluid to form the second fracture. This process is repeated as needed.

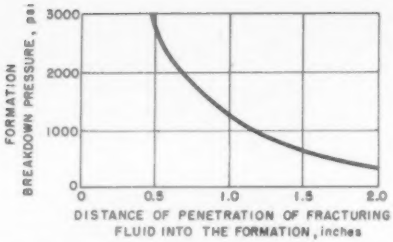


Fig. 1—Effect of fracturing fluid penetration on formation breakdown pressure.

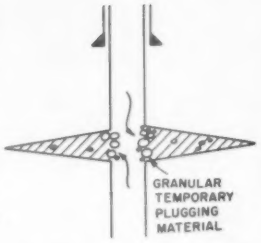


Fig. 2—Surface bridging by granular temporary plugging agent.

fracturing fluids, this multiple-fracturing method can be used to treat sandstones, and both high and low-acid-solubility carbonate rocks. Thus, in the following discussion of the multiple-fracturing method, the terms transporting and fracturing fluids refer to either napalm-hydrocarbon gels or thickened acids, depending upon the type of formation being treated.

The two key points on which the success of the multiple fracturing method depend are: (1) effective sealing of previously formed fractures with a plugging agent sufficiently strong to allow imposition of much higher pressure at other sections of the formation being treated; and (2) removal of plugging agent at completion of treating operation to allow free flow of the formation fluid into well through all of the fractures created. The presence of these multiple fractures results in a greatly reduced resistance to the flow of fluids to the well bore.

The plugging agent . . . This must meet two major requirements. First, it must have physical characteristics to effect an impervious seal of existing fractures. Evaluation work on the various plugging agents indicated that the granular-type additive is more effective than either the fibrous or lamellated type in restricting the pressure to the well bore, due primarily to the fact that this type material tends to seal on the surface or at the face of a fracture. This sealing or bridging, illustrated in Fig. 2, is accomplished by the larger size particles bridging at the opening of the fracture and the smaller particles then, in turn, bridging on the larger particles until a seal is accomplished.

The second major requirement that the plugging agent must meet is that it should be temporary in nature so that after the treating operation is complete, the plugging agent will not restrict the flow of formation fluid through the fractures so created. Among the other factors which must be considered are effect of temperature and pressure, and the melting point and solubility of the plugging agent. The material most commonly used at the present time which meets both of these requirements is compressed and ground pellets of naphthalene which are completely soluble in crude oil after a predetermined length of time.

To fit multiple-fracturing operations closer to widely varying well conditions, two broad types of treatment are used. These two methods are discussed below:

Single-Batch Multiple Fracturing

Single-batch multiple fracturing is particularly applicable to wells having relatively short producing sections or producing from formations having relatively low, uniform resistance to the flow of oil. Under such conditions, only a few fractures are generally required to drain effectively this type of reservoir. By altering the composition of the transporting and fracturing fluids, both sandstone and all types of carbonate rocks may be treated.

Results obtained . . . Of the five wells treated as of March 1, 1952, with this version of the multiple-fracturing method, four wells have responded with sustained production increases; one well failed to respond, due apparently to a nonproductive formation. A typical treatment by this method resulted in 250 per cent more oil production.

Multiple-Batch Multiple Fracturing

Operations of the multiple-batch multiple fracturing type are particularly applicable to relatively long producing sections, or to producing formations having a high resistance to the flow of oil. Generally, a large number of fractures are required to drain effectively this type of formation. As with the single-batch multiple-fracturing method, this procedure may be used in any

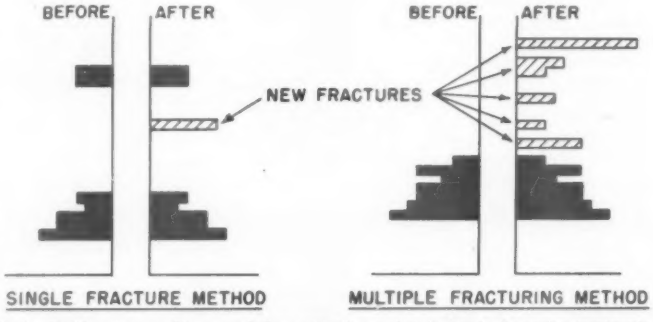


Fig. 3—Profile of permeable zones before and after typical hydraulic fracturing treatments.

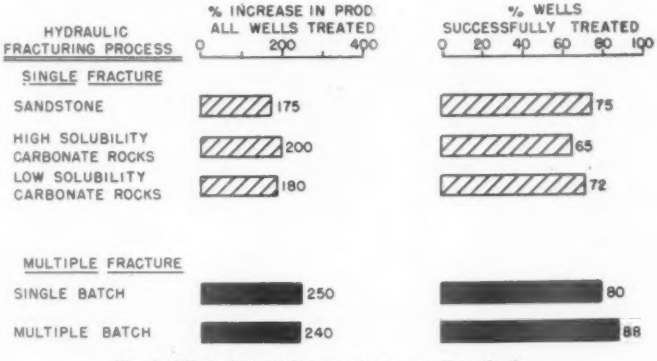


Fig. 4—Effect of fracturing operations on well production.

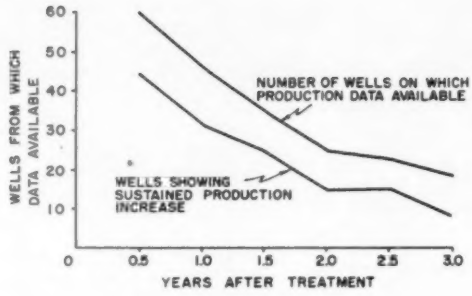
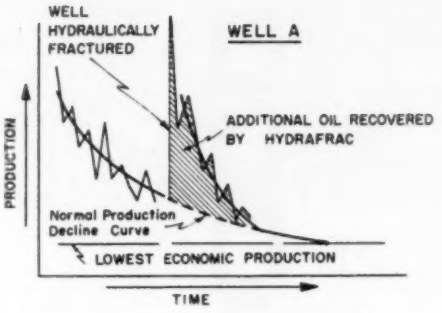


Fig. 5 — (Above) Production sustained after hydraulic fracturing.



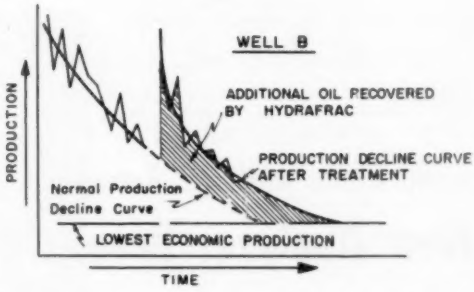


Fig. 6 — (Right) Additional oil recovery by hydraulic fracturing.

type of producing formation by altering the composition of the transporting and fracturing fluids.

Results obtained . . . As of March 1, 1952, this method of hydraulic fracturing has been used in approximately 25 wells. Of these 25 wells treated, 22 have responded with sustained production increases for a success percentage of 88 per cent. A typical treatment by this method will result in an average of 240 per cent more oil production.

Results

Results of two typical well surveys conducted to determine the location of the more permeable zones of a producing formation before and after both single-fracture and multiple-fracture treatment, are shown in Fig. 3. These surveys were conducted by injecting oil into the producing formation and measuring the amount of fluid being displaced into each zone.

The survey measurements are made by lowering into the well an instrument containing a propeller. As the injected fluid is forced past the instrument, the fluid velocity causes the propeller to rotate. By measuring the rate of rotation of the propeller and correlating this with the diameter of the well, the volume of fluid entering the formation at any point is computed.

Fig. 4 presents a summary of the results obtained from each of the variations in the basic hydraulic fracturing processes. From this figure, it appears that multiple fracturing not only tends to increase the frequency of success, an average of 84 per cent for multiple fractures vs. approximately 70 per cent for single fracture, but also tends greatly to increase the well's productive capacity, as evidenced by an average increase in production of 245 per cent for multiple fracturing as compared to an average of 185 per cent for single-fracture methods.

The question that has been frequently asked is, "Do Hydrafrac treatments result in a sustained production increase and if so, does the extra production represent an increase in the proved oil reserves or is the same amount of oil merely recovered more readily?"

Ability of the hydraulic-fracturing method to effect a sustained production increase is illustrated in Fig. 5. An analysis of this figure shows that at the end of 6 months 75 per cent, or 45 of 60 wells on which data were available, showed a sustained production increase. At the end of 2 years, data were available on 25 wells. Of these, 15 wells, or 60 per cent, showed a sustained production increase. At the end of 3 years, 55 per cent, or 10 of 18 wells had a production rate greater than before hydraulic-fracturing treatment. The lack of information on additional wells at the end of the third year is primarily a result of the small number of treatments conducted in the early stages of field application of this process. Production data on wells treated more than 3 years ago are limited to so few wells that they were not considered. These data would seem to indicate that the hydraulic-fracturing process is capable of effecting a sustained production increase for long periods of time following treatment.

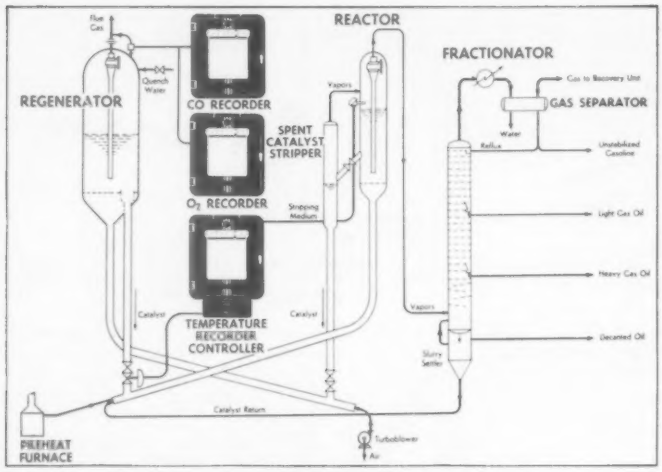
The answer to the question, "Does hydraulic fracturing increase the recoverable crude-oil reserves or does this process merely permit the production of the original recoverable oil in a shorter period of time?" can best be demonstrated by referring to Fig. 6.

In a nutshell . . .

The process of hydraulically fracturing a formation has been developed from an idea into a large commercial process, now ranking as one of the major methods of stimulating the producing capacity of all types of wells.

The process was licensed to Halliburton Oil Well Cementing Co. in March 1949, and as of March 1952 . . .

- **10,460 treatments have been performed in 9,360 wells.**
- **Of the 9,360 wells treated, approximately 7,000 wells or 75 per cent have successfully responded to treatment.**
- **Increase in production has averaged 175 per cent.**



CATALYTIC CRACKING UNIT flow diagram. Fig. 1.

ELIMINATING BANEFUL AFTERBURN

New Analyzer Breaks Bottleneck In F.C.C. Operation

Instrument is very simple piece of equipment, is rugged enough to take all the vibration a regenerator can give it, and instrument maintenance men are entirely capable of maintaining analyzer and sampling system.

by J. L. Serrill, Jr,*

USE of an infrared-type carbon monoxide analyzer makes possible a faster carbon-burning rate during regeneration of fluid catalytic cracking units. This eliminates one of the biggest bottlenecks to increased production from these units.

Afterburn, the bane of a cat cracker operator's existence, can virtually be eliminated by use of this analyzer. Warned of presence of conditions which produce afterburn, the operator can make the necessary adjustments to prevent it.

Additional benefits are (1) increased conversion rate; (2) increased catalyst life; and (3) improved efficiency of operations during startups, shutdowns, and during catalyst addition and removal.

The production capacity of a fluid cat unit is determined primarily by the type of products being produced, in conjunction with the carbon burning rate. When the unit is being run for large-quantity fuel-oil production, the cracking is "light" and less carbon is laid down on the catalyst for a given quantity of finished product than when the unit is being run for maximum gasoline production where the cracking is "hard."

Thus the carbon burning rate will be more of a factor in determining the unit's production capacity when gasoline is produced, than when fuel oil is being made. This article is based primarily on the requirement of high gasoline production.

In order to see how the use of a carbon monoxide analyzer solved this problem it is necessary to review some of the fundamentals of the fluid catalytic cracking operation.

Fluid cat flow . . . Fig. 1 shows the fundamental components of a fluid type catalytic cracking process unit. The major components are:

1. **A reactor** wherein the vaporized oil charge reacts in the presence of the catalyst, resulting in molecular decomposition of the oil to produce greater quantities of the lighter, more volatile hydrocarbon components.

2. **A regenerator** in which the carbon deposit on the catalyst particles, a result of the cracking operation in the reactor, is burned off.

3. **A fractionator** in which the overhead vapors from the reactor are separated into the various desired products.

The charge stock is preheated to about 800° F. and is introduced into the transfer line to the reactor. At the point of introduction the charge is combined with hot (approximately 1,050° F.) regenerated catalyst and this mixture flows to the reactor where cracking takes place.

As the charge stock is cracked the lighter hydrocarbons rise to the top section of the reactor known as the vapor space and are then transferred to the fractionator. At the same time a carbon deposit is laid down on the catalyst which reduces its activity in aiding the cracking reaction. This "spent" catalyst is heavier than the fresh regenerated catalyst and thus under controlled conditions falls to the bottom of the reactor where it is guided to a "stripper" unit.

Here steam removes and carries the reclaimable oil back to the vapor space in the reactor. The "spent" catalyst then drops to the regenerator air supply line where it is mixed with the combustion air and is carried to the regenerator.

In the regenerator carbon burning takes place. The burning is started by the high temperature of the carbon-covered catalyst in the presence of the excess air. The regenerator is generally divided into a dense-phase section toward the bottom and a lean-phase section toward the top, with regeneration taking place primarily in the dense phase at a temperature of 1,050° F. to 1,150° F.

The products of combustion rise to the lean-phase section and pass through cyclone separators for removal of catalyst fines—the products of combustion going on up the stack. The regenerated catalyst is then ready to be combined with the charge stock and start its cycle all over again.

Higher burning rate . . . The problem of increasing the carbon-burning rate revolves about another problem, that of preventing afterburning. Afterburning is a condition which is believed to occur primarily in the lean-phase

*Leeds & Northrup Co., Philadelphia. Presented at A.S.M.E. semiannual meeting, Cincinnati, June 1952.

Over Mountains - Thru Mudholes!

The laying of a section of 30-inch pipeline for the Texas Eastern Transmission Corp. across the precipitous mountains of Ohio and West Virginia this spring was a job that had looked "too tough" to other pipeliners. That's when H. C. Price Co. crews were called upon to take over. *Mountains so steep that six winch tractors were required to hold ditching equipment . . . rock ledges hundreds of feet thick . . . incessant rains that turned the right-of-way into an endless mudhole . . . and the pressure of a fast-approaching deadline.* All these problems were met in stride and the new pipeline completed on time—once again demonstrating that HCPCO is truly "America's Foremost Pipeline Constructors."

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section of the top third of the regenerator and is essentially the combustion of CO to CO_2.

The burning of CO to CO_2 generates a large amount of heat and can raise the lean-phase temperature of the regenerator up to a point where the metal work in the regenerator itself can be seriously damaged, causing unscheduled shutdowns of the catalytic cracker. This has happened more than once. Therefore, operators endeavor to hold conditions in the regenerator to burn as much of the carbon on the catalyst as possible to CO with a minimum production of CO_2.

By producing a maximum of CO the most efficient use of the air is made in removing carbon from the catalyst and less total heat is produced.

Temperature in the regenerator must be held to a maximum of about 1,150 F. or serious deterioration of the catalyst will result. This temperature is also high enough to provide the combustion of CO to CO_2 and yet it is at this temperature where maximum carbon burning takes place.

The result—the catalytic cracker regenerator is a furnace with a tremendous mass of combustible material being held in a very unstable state from a combustion viewpoint. Yet this is precisely the condition which must be and can be maintained.

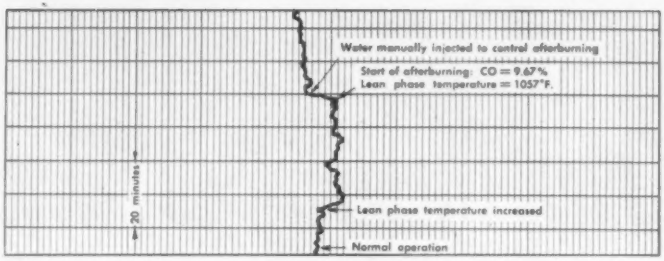
Problem afterburning . . . If the catalytic unit is not being pushed to its maximum production, afterburning is generally not a serious problem because a lower carbon-burning rate is acceptable. The bad temperature in the regenerator may be lowered and/or the primary air supply may be reduced to a point where there is practically no oxygen present in the flue gas. Both of these actions reduce the tendency for afterburning to take place.

However, in the last 5 or 6 years most every catalytic cracker has been pushed to its maximum capacity which is generally much higher than its rated capacity. Under these conditions the primary air to the regenerator is set up to its maximum amount and the other variables such as charge-stock feed rate, catalyst-circulation rate, etc., are regulated to the point at which the maximum carbon-burning rate will take place.

This maximum carbon burning rate can bring the regenerator into extremely unstable combustion conditions and considerable work has been done to find ways and means of maintaining this maximum carbon-burning rate and yet eliminate afterburning.

Use of CO Gas Analyzer

Since afterburning seems to occur completely at random, it was thought that a flue-gas analysis might give a satisfactory indication, because variations in flue-gas composition indicate composite combustion conditions throughout the regenerator and not just localized measurement.


Water manually injected to control afterburning
Start of afterburning: CO = 9.67%
Lean phase temperature = 1057°F.
20 minutes
Lean phase temperature increased
Normal operation

CO RECORD showing effect of afterburn. Fig. 2.

Afterburning: a problem in F.C.C. operation.

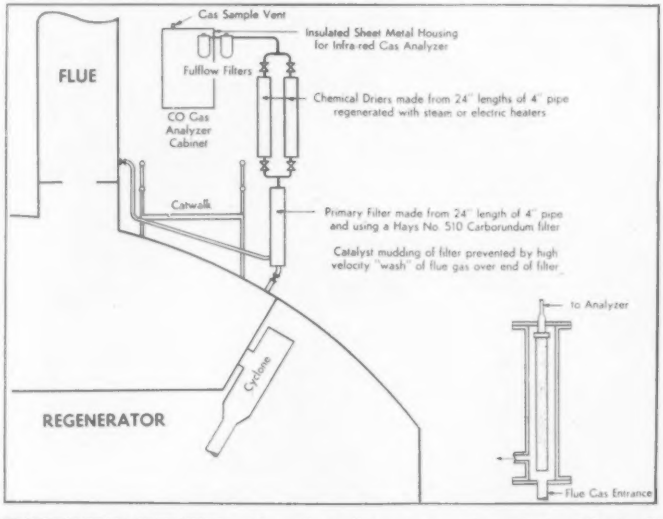
Carbon monoxide was selected as the gas compound to be measured, since the primary objective in a fluid catalytic cracker regenerator is to burn the carbon on the catalyst to CO and vent the CO to the atmosphere. A measurement of the CO content of the flue gas indicates to the operator how well this operation is being carried out.

Furthermore, the CO content of the flue gas is an excellent indicator of afterburning and warns the operator immediately of the beginning of this condition.

The gas analyzer selected to make this measurement was an infrared-type analyzer, with high sensitivity and a very high speed of response (10 seconds for a 90 per cent of a change). This type of analyzer should not be confused with the thermal conductivity types of gas analyzers because its principle of operation is entirely different.

Test program . . . When the first CO analyzer was installed, the operating procedures were not immediately changed. A test program was laid out to learn what benefits might be derived from the use of the analyzer and how its measurement could best be incorporated into the operating procedure. The first and perhaps most significant fact that was learned, was that the analyzer indicates the start of an afterburn with speed and clarity.

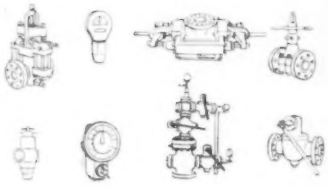
There is a distinct sharp drop in the CO content of the flue gas about 7 minutes before any indication of a temperature rise in the lean phase. The oxygen recorder shows a slight drop about 4 minutes after the CO


Gas Sample Vent
Insulated Sheet Metal Housing for Infra-red Gas Analyzer
FLUE
Fulflow Filters
Chemical Driers made from 24" lengths of 4" pipe regenerated with steam or electric heaters
CO Gas Analyzer Cabinet
Catwalk
Primary Filter made from 24" length of 4" pipe and using a Hays No. 510 Carborundum filter
Catalyst mudding of filter prevented by high velocity "wash" of flue gas over end of filter
to Analyzer
Cyclone
REGENERATOR
Flue Gas Entrance

TROUBLE-FREE OPERATION with routine maintenance every 3 months is achieved with this sampling system. Fig. 3.

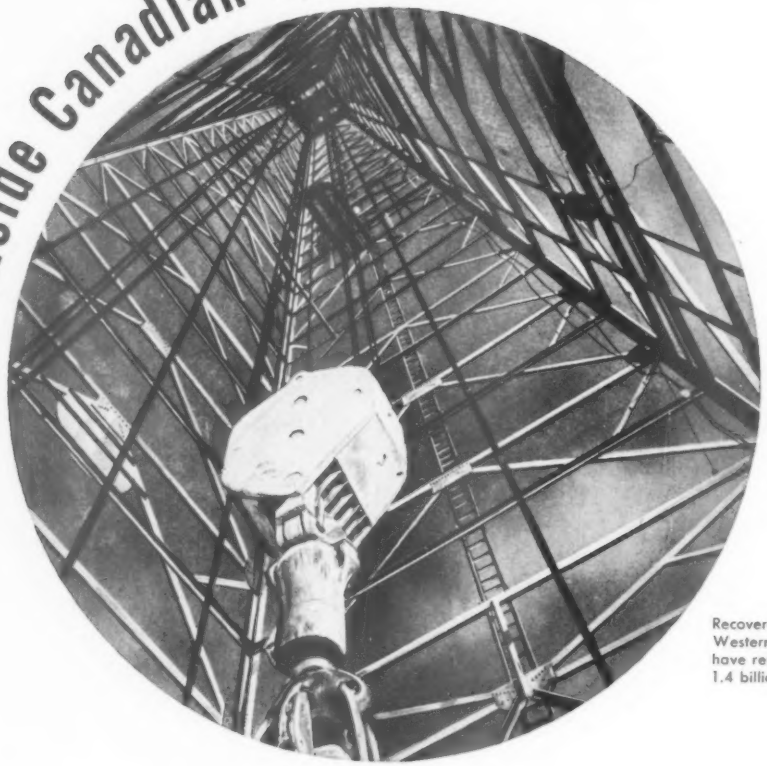
Billion dollar blowout

It happened at Hull, Texas, in 1922. A young contractor by the name of *Jim Abercrombie* was re-working a well when it blew out and caught fire. As he watched his hard-won equipment being destroyed, he resolved to do something about this menace that had begun to stalk the struggling young oil industry. Soon, from his newly acquired "repair shop" . . . *Cameron Iron Works* . . . came the first crude model of a ram-type blowout preventer. This was the grand-daddy of the now famous pressure-operated Cameron Blowout Preventers which have become a byword in the oil fields. Their savings to the industry are already inestimable . . . *perhaps a billion dollars or more* . . . considering the valuable reservoir pressures, costly well bores and machinery and the conservation of tremendous quantities of oil and gas. So, an event which might have passed as just another blowout in the roaring twenties actually sparked the development of the Cameron line of drilling and completion control equipment that is now regarded as the standard of comparison the world over.



C.I.W., Inc., P. O. Box 1212, Houston, Texas Export: 7912 Empire State Bldg., New York, N. Y.

Inside Canadian Oil



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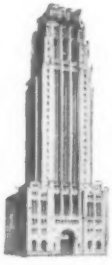


drop is recorded. The operators then began to use the CO analyzer as an afterburn indicator and found that the afterburn can be quenched almost immediately with the lean phase water sprays, provided they are used when the CO analyzer shows the first signs of an afterburn.

After the water sprays quench the afterburn, the charge rate and/or the catalyst circulation rate is trimmed to bring the regenerator operation out of the afterburn region, maintaining high production all the while. This is not possible when the water sprays are used on the basis of the temperature and oxygen records alone, because by the time they show an afterburn it is too well established to be quenched immediately by the sprays alone. The charge rate and catalyst circulation rate have to be reduced appreciably, thus reducing production.

Fig. 2 shows a typical record where conditions were purposely established for the unit to go into an afterburn. This was done by reducing the water to the lean-phase sprays below the amount required for normal operation, thus raising the lean-phase temperature. (In normal operation a certain amount of water is continuously being sprayed into the lean phase section to hold the lean-phase temperature down to about 1,050° F.). The record clearly shows the increase of the CO content and in about 25 minutes the unit started into an afterburn, where the CO record drops rapidly. The operator brought it under control almost immediately by increasing the water to the lean-phase sprays.

Other tests . . . Tests over a period of several months revealed the fact that the maximum carbon-burning rate was obtained when the oxygen content in the flue gas was raised from 0.5 per cent up to about 1.5 or 2 per cent. Since the dense-phase temperature was already being held at 1,100° F. to 1,150° F. and the lean-phase temperature at 1,050° F. the higher oxygen content increased the possibilities for an afterburn to occur. Yet with the CO analyzer record as a guide, the operator was able to adjust the many variables to virtually keep the unit free of afterburns.

Actually operators claim that they can keep the unit in a controlled afterburn without any difficulty. In this manner, a CO to CO_2 ratio of almost 1 to 1, with the CO content running about 9.5 to 10 per cent, and an oxygen content of 1.5 to 2 per cent is maintained.

O_2 analysis needed . . . Both the operators and process engineers emphasize

With CO analyzer: better carbon burning, less afterburn

the fact that the CO analyzer does not replace the need for an oxygen measurement. The two analyzers work together in carrying out the catalytic cracker operating procedure. This was especially true since it was learned that the higher (1.5 to 2.0 per cent) oxygen content was required for the most efficient carbon burning rate.

Furthermore, as the operating procedures are established for the various types of charge stock and the various types of end products, operators adjust the process variables to give certain values of carbon monoxide, oxygen, and temperature. Thus in a very short period of time the unit can be changed from one operation to another and be operating at top efficiency.

Over-all results . . . It has been found that over a period of time units equipped with CO analyzers burn more carbon per unit volume of air consumed than do other units which do not have CO analyzers. The facts also show that CO analyzer equipped units have the fewest afterburns.

Other benefits are also realized. During standby operation when the catalyst in the regenerator is being heated by torch oil to maintain its temperature, the CO analyzer indicates when the most efficient combustion is occurring. Startup time has been reduced by a matter of hours. Another benefit is the increase in the life of the catalyst. This is a result of the elimination of the afterburns which, with their associated high temperatures, reduce the catalyst life.

Manual control . . . Considerable thought was given to applying automatic control to the CO analyzer which would then automatically keep the regenerator at its maximum carbon-burning rate. This has not been found feasible so far, but has possibilities in the future.

At present there are so many variables which affect the CO content of the flue gas, plus the fact that there is such a large capacity to work with, it is believed that automatic control adjusting just one variable would not give satisfactory results.

Sampling System

All infrared-type gas analyzers require a clean sample with a dew point lower than would exist at the analyzer cabinet temperature of 130° F. The catalytic cracker regenerator CO application was particularly difficult in this respect, because of the large amount of catalyst fines and the large quantity of water in the flue gas which comes from the normal operation of the water sprays.

Several sampling systems were tried before one was developed. Fig. 3 shows a system which gives trouble-free operation with only routine maintenance every 3 months.

It can be seen that the main sample flow through the primary filter would have a high velocity and this keeps catalyst mud from covering the carborundum filter.

Many catalytic cracker regenerators do not have an orifice in the flue line as shown in Fig. 3. In these cases the exit line from the primary filter is located on the stack side of the waste-heat boiler or precipitator or even vented directly to the atmosphere. The sample point in the regenerator is located on the flue side of the cyclones. In this way a great deal of the catalyst fines is removed from the gas sample inside of the regenerator.

Further removal of catalyst fines occurs at the primary filter. On those installations where the gas sample was not allowed to pass around the primary filter at high velocity, considerable plugging was experienced and in several subsequent installations it has been proved that the primary carborundum filter has to be "washed" by the high-velocity gas stream for reliable results. Furthermore, with this type of primary filter installation the time lag in the sample system is quite low (about 5 seconds).

The only precaution required is that 1-in. pipe with extra extra-heavy wall be used for the inlet and outlet connections. The high-velocity gas stream carrying catalyst fines erodes through thinner pipes in a relatively short time.

The drivers are generally made by the user. It has been found that about 2 ft. of 6 in. pipe filled with a chemical drier such as silica gel will work very well. This gives small capacity which keeps the sample lag small and yet is large enough for efficient drying. Regeneration of the drier can be done with steam or electricity and it has been found that regeneration once every 2 days is ample on a normal installation, although several installations do it automatically once a day or oftener.

In addition to the primary filter and chemical drier are two Ful-Flow cartridge-type filters which take out the last traces of catalyst dust. The sample leaves the driers under about 3 psi. pressure and the exit tube from the analyzer is vented to the atmosphere. The gas sample velocity through the analyzer is about 2 cu. ft. per hour.

Maintenance . . . Maintenance of the equipment has proved to be very small. With the sampling system previously described, the cell has to be cleaned once every 3 or 4 months. Cell cleaning can be done on the site and consists of removal of the sample cell from the analyzer and dusting off the catalyst fines that have crept in over a period of time.

Actually the analyzer is a very simple piece of equipment and sufficiently rugged to take all the vibration a "boiling" regenerator can give it. Instrument maintenance men are entirely capable of maintaining the analyzer and sampling system and the maintenance cost on an average installation runs about $8.00 per week.

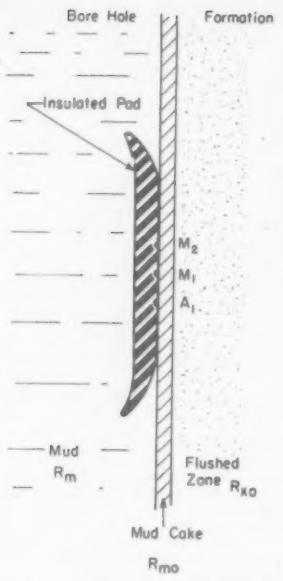


Fig. 1—Schematic representation of MicroLogging device in case of a porous and permeable formation.

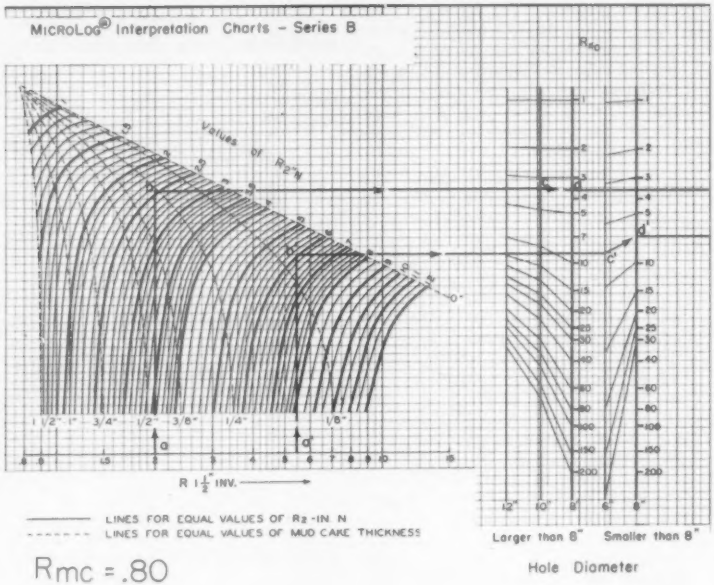


Fig. 2—MicroLog

Application of MicroLogging to Determination

by H. G. Doll,* R. Sauvage,† and M. Martin†

This article, prepared for The Oil and Gas Journal, concerns the application of the MicroLog‡ to the evaluation of porosity of formations, by means of appropriate interpretation charts.

- **It will be shown that an approach towards the evaluation of porosity is given through determination of resistivity of the porous formations close to the wall of the hole.**
- **How the value of this resistivity can be derived from the MicroLog will then be explained.**
- **Next, the interpretation charts will be described, and their application will be illustrated with field examples.**
- **In addition to this, the use of the MicroLog in the quantitative determination of fluid saturation will be discussed.**

*Director of research, and †interpretation department, Schlumberger Well Surveying Corp., Ridgefield, Conn.

‡Reg. U. S. Pat. Off.

THE following explanations will be mostly related to the case of formations containing a negligible amount of conductive solids. A few additional remarks will be nevertheless brought forward regarding the case of shaly formations.

The symbols used in the present paper are:

R_{xo} = resistivity of a porous and permeable formation close to wall of the hole
R_w = resistivity of connate water
R_t = true resistivity of formation
R_m = resistivity of mud
R_{mf} = resistivity of mud filtrate
R_{mc} = resistivity of mud cake
$R_{1\,1/2\,in.\,Inv.}$ = value recorded with 1½-in. Microinverse device
$R_{2\,in.\,N}$ = value recorded with 2-in. micronormal device
h = thickness of mud cake
ϕ = porosity
F = formation resistivity factor

The principle of the MicroLog and its application to the determination of the permeable beds traversed by a bore hole were given in an earlier paper.[1]

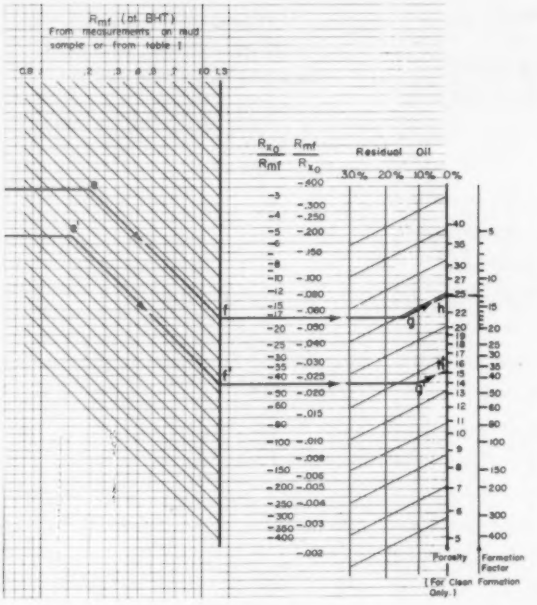
Relationship Between Porosity and R_{xo}

It is known that, if a formation is practically clean, and is entirely impregnated with an electrolyte, the ratio of the resistivity of the formation to the resistivity of the electrolyte is a constant, whatever the resistivity of this electrolyte. This constant designated as "Formation Resistivity Factor"[2] — or more simply "Formation Factor"—in turn is a function of the lithology of the formations, and mostly of the porosity. The following formula has been proposed to express the relationship between formation factor and porosity:

$$F = \frac{a}{(\phi)^m}$$

with F being the formation factor, ϕ the porosity, a and m two parameters depending on the nature of the formations.

Several values, variable mostly with the types of formations selected for the experiments, have been proposed for a and m,[2 3 4] but the curves showing F vs. ϕ for these various values of a and



interpretation charts.

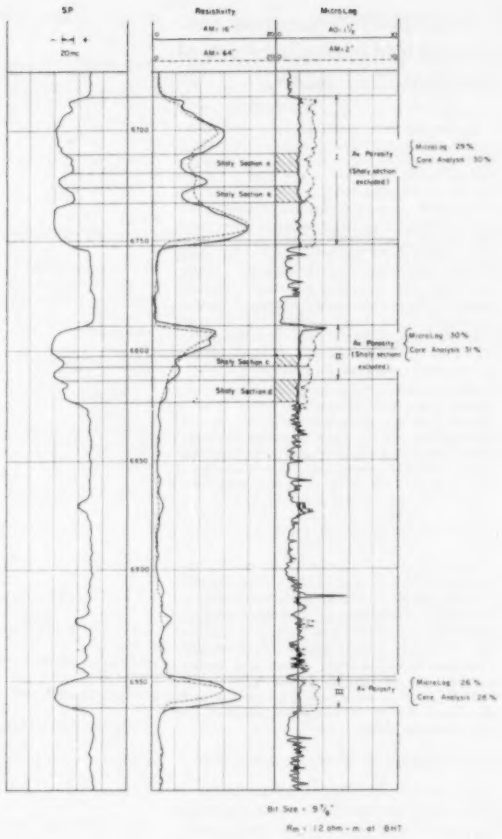


Fig. 3—Example of quantitative interpretation of MicroLog (clean formations of high porosity).

# of Porosity

Part 1 of Two Parts

m are not much different from one another.*

The evaluation of porosity through electrical measurements is based on the determination of the formation factor. For such a determination to be possible by measurements in situ it should be assumed that there exists one part of the porous formation under study which is saturated with a water of known resistivity, and that the resistivity of this part of the formation can be measured:

It occurs that, within a short distance from the wall of the hole, the connate water is entirely displaced by the penetration of mud filtrate and that the oil remaining in the pores, if any, is reduced to a small amount. The value generally accepted for the extension of this flushed zone from the wall is about 2-3 in.; farther on, the proportion of original fluids progressively increases until a distance is reached where the formation is completely uncontaminated.

When there is no residual oil in the flushed zone, as in the case of water-bearing formations, the formation factor—still supposing the formation is practically clean—will be equal to R_{xo}/R_{mf}, with R_{xo} being the resistivity of the flushed zone, and R_{mf} the resistivity of the mud filtrate—and the porosity will be given by:

$$\phi = [0.62\,(R_{mf}/R_{xo})]^{1/2.15}$$

In the case of oil-bearing formations, if **ROS** is the residual oil saturation, the formula will become:

$$\phi = \frac{1}{1 - \mathbf{ROS}}\,[0.62\,(R_{mf}/R_{xo})]^{1/2.15}$$

The determination of the porosity thus depends on the knowledge of factors R_{mf} and R_{xo}:

The value of R_{mf} can be easily measured from a sample of mud or can be estimated from statistics (this question will be further examined later on).

Factor **ROS** is not exactly known, but can be taken as approximately equal to the statistical value of the per cent per pore volume of residual oil in the cores, i.e., from about 10 to 30 per cent.

The value of R_{xo} can be derived, within certain limits, from the MicroLog by means of appropriate interpretation charts as explained hereafter.

R_{xo} vs. MicroLog Readings

It is recalled that in the method of MicroLogging the measuring device essentially comprises a system of very small electrodes $A M_1 M_2$ at short distance from each other and borne by an insulating pad which is applied to the wall of the hole (Fig. 1). The measurements accordingly are related to very small volumes of material located behind the wall and shielded from the by-pass effect of the mud. Two curves are simultaneously recorded, with two distributions of electrodes corresponding to two depths of investigation: namely the 1½-in. Microinverse ($AM_1 = 1$ in. $M_1M_2 = 1$ in.) and the 2-in. Micronormal ($AM = 2$ in.).

*The equation proposed by W. A. Winsauer et al.,[3] namely $F = \dfrac{0.62}{(\phi)^{2.15}}$ has been used for the computation of the numerical values of porosity given in the interpretation charts.

POROSITY—This page contains actual example of use of interpretation charts.

In the case of a permeable and porous formation the pad is separated from the formation by the mud cake. The measurements are therefore affected both by the mud cake and by the formations behind and close to the wall, which, as said above, are flushed by the mud filtrate. The measurements are functions of R_{xo}, resistivity of the flushed zone, R_{mc}, resistivity of the mud cake, h, thickness of the mud cake, and d, diameter of the bore hole (the experience has shown that the resistivity R_m of the mud has only a secondary effect, which can be neglected for all practical purposes in most cases). The Micronormal curve is more affected by R_{xo} and less by the mud cake than the Microinverse.

The diameter of the bore hole is generally known from the bit size, or better from a section gage log, if such is available. The resistivity R_{mc} of the mud cake can be determined from a sample of mud, or from statistics. The measured values therefore depend only on two unknown factors, namely R_{xo} and h. Conversely the determination of R_{xo} and h is based on the two values measured with the Microinverse and Micronormal devices.

Because of the geometry of the various media involved in a MicroLog measurement, there is no possibility at the present time to determine mathematically the relationship between the factors involved: R_{xo}, h and the two MicroLog measurements. This relationship has therefore been established experimentally on laboratory models. The results of these determinations are given in the form of curves, which constitute the basis of the interpretation charts.

Description of Interpretation Charts

A catalog of interpretation charts is now available for the users of electrical logging.[5] Each chart of the catalog corresponds to a given value of R_{mc} at bottom-hole temperature. The range of values taken for R_{mc} extends by steps from 0.03 to 5. One sample chart is reproduced on Fig. 2.

Table 1 gives the values of R_{mc} and R_{mf} versus R_m and temperature. This table contains average values determined in the laboratory on numerous and varied samples of mud. These values are therefore only approximate, and the values of R_{mc} and R_{mf} should preferably be measured in each given case.

Each chart (Fig. 2) comprises from the left to the right:

(a) A double set of curves, traced with $R_{1\ 1/2\ in.\ inv.}$ plotted in abscissas and R_{xo} in ordinates, both scales being logarithmic.* The solid curves correspond to constant values of $R_{2\ in.\ N}$, and the dashed curves to constant values of mud cake thickness.

(b) A grid containing several vertical scales corresponding to different hole diameters. This grid is actually divided into two parts: the left-hand part contains the scales for hole diameters equal to or larger than 8 in. up to 12 in., the right part the scales for hole diameters equal to or smaller than 8 in. down to 6 in. The value of R_{xo} is read on either of the 8-in. scales (heavy lines).

(c) A grid giving the values of R_{xo}/R_{mf} corresponding to the values of R_{xo}, for different values of R_{mf}. The value of R_{xo}/R_{mf} is read on the right-hand scale (heavy line).

(d) A grid giving the values of porosity corresponding to the value of R_{xo}/R_{mf} for different values of the per cent of residual oil in the flushed zone. The scale of porosity shown is derived from the application of formula $F = \frac{0.62}{(\varphi)^{2.15}}$,[3]

*Note that the horizontal grid traced throughout the chart is not logarithmic but is made up of equally spaced lines. This grid is merely a guide for the graphic use of the charts.

TABLE 1

R_m (BHT)	100°	125°	150°	175°	200°	225°	250°
	R_{mc} or R_{mf} at BHT						
.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
	0.09	0.10	0.11	0.12	0.12	0.13	0.13
.04	0.05	0.05	0.05	0.05	0.05	0.03	0.03
	0.15	0.14	0.15	0.16	0.16	0.16	0.17
.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	0.17	0.18	0.19	0.19	0.19	0.20	0.20
.06	0.05	0.05	0.05	0.05	0.04	0.04	0.04
	0.20	0.22	0.22	0.22	0.25	0.23	0.25
.07	0.06	0.06	0.05	0.05	0.05	0.05	0.04
	0.24	0.25	0.26	0.26	0.26	0.26	0.26
.08	0.06	0.06	0.06	0.06	0.05	0.05	0.05
	0.28	0.29	0.29	0.29	0.29	0.29	0.29
.09	0.07	0.07	0.06	0.06	0.05	0.05	0.05
	0.31	0.32	0.33	0.33	0.33	0.32	0.32
.10	0.08	0.07	0.07	0.06	0.06	0.05	0.05
	0.35	0.39	0.39	0.39	0.38	0.37	0.37
.12	0.09	0.08	0.07	0.07	0.06	0.06	0.06
	0.46	0.46	0.46	0.45	0.44	0.42	0.41
.14	0.10	0.09	0.08	0.08	0.07	0.07	0.07
	0.56	0.55	0.54	0.53	0.50	0.48	0.46
.17	0.11	0.10	0.09	0.09	0.09	0.09	0.09
	0.66	0.64	0.62	0.60	0.56	0.52	0.48
.20	0.12	0.11	0.10	0.11	0.11	0.11	0.12
	0.80	0.78	0.72	0.67	0.60	0.57	0.53
.25	0.14	0.13	0.13	0.14	0.15	0.15	0.16
	0.95	0.87	0.78	0.72	0.66	0.60	0.54
.30	0.16	0.16	0.16	0.17	0.18	0.19	0.20
	1.05	0.96	0.86	0.76	0.68	0.59	0.54
.35	0.18	0.19	0.20	0.21	0.22	0.23	0.24
	1.14	1.00	0.88	0.79	0.70	0.65	0.58
.40	0.21	0.23	0.24	0.25	0.26	0.28	0.28
	1.25	1.10	0.90	0.80	0.70	0.65	0.60
.50	0.22	0.31	0.32	0.34	0.36	0.37	0.38
	1.29	1.09	0.91	0.82	0.73	0.68	0.63
.60	0.37	0.39	0.41	0.43	0.45	0.46	0.47
	1.38	1.12	0.98	0.86	0.76	0.70	0.66
.70	0.45	0.48	0.50	0.53	0.55	0.56	0.57
	1.40	1.16	1.00	0.91	0.79	0.76	0.73
.80	0.53	0.57	0.59	0.62	0.65	0.66	0.67
	1.42	1.20	1.06	0.92	0.85	0.82	0.79
.90	0.62	0.66	0.68	0.72	0.74	0.76	0.77
	1.46	1.25	1.05	0.95	0.90	0.88	0.86
1.0	0.70	0.76	0.79	0.82	0.84	0.85	0.87
	1.52	1.26	1.14	1.07	1.04	1.02	1.02
1.2	0.89	0.95	0.99	1.01	1.03	1.04	1.06
	1.57	1.36	1.26	1.22	1.19	1.19	1.18
1.4	1.08	1.13	1.18	1.20	1.23	1.23	1.25
	1.67	1.51	1.48	1.43	1.43	1.41	1.39
1.7	1.38	1.44	1.48	1.50	1.51	1.53	1.53
	1.82	1.72	1.70	1.68	1.66	1.64	1.64
2.0	1.68	1.72	1.75	1.78	1.80	1.80	1.80
	2.18	2.12	2.08	2.08	2.05	2.05	2.02
2.5	2.15	2.20	2.22	2.25	2.25	2.25	2.25
	2.55	2.50	2.49	2.46	2.46	2.46	2.46
3.0	2.64	2.70	2.70	2.70	2.70	2.70	2.70
	2.84	2.90	2.87	2.87	2.87	2.84	2.84
3.5	3.12	3.15	3.15	3.15	3.15	3.15	3.15
	3.32	3.32	3.28	3.28	3.28	3.28	3.28
4.0	3.56	3.60	3.60	3.60	3.60	3.60	3.60
	4.10	4.10	4.10	4.10	4.10	4.10	4.10
5.0	4.50	4.50	4.50	4.50	4.50	4.50	4.50

The above tabulated values are average values as determined in the laboratory. If R_{mc} and R_{mf} can be measured, the measured values should be used instead of those above.

Directions for Use of Charts

Directions for use of the charts (for the case of clean formations) are illustrated by means of an example, corresponding to the following values:

R_m at 160° = 0.35

$R_{1\ 1/2\ in.\ inv.}$ = 2 ohms-m.

$R_{2\ in.\ N}$ = 2.5 ohms-m.

Hole diameter: 10 in.

1. Enter the value of the temperature prevailing at the level of the bed under investigation, and the value of R_m corrected for this temperature into Table 1. The intersection of the column corresponding to the value of the temperature and of the line corresponding to the value of R_m gives the corresponding values of R_{mc} and R_{mf}, as derived from the average laboratory determinations.

Example: With R_m at 150° = 0.35 and interpolating between the temperatures of 150° and 175°, the table gives R_{mc} = 0.8 and R_{mf} = 0.2.

If R_{mc} and R_{mf} are measured directly on a sample of mud, the values measured should be taken instead of the ones given by the table.

2. Choose the chart printed for the value of R_{mc} the closest to the value read on the table (or measured on the sample).

Example: The chart for R_{mc} = 0.8 is used.

3. Start from the left-hand side of the chart. Plot the value of $R_{1\ 1/2\ in.\ inv.}$ read on the MicroLog (2, in the example) in abscissa. This gives point "a." Draw from "a" a vertical line up to the intersection in "b" with the curve (solid line) corresponding to the value of $R_{2\ in.\ N}$ read on the MicroLog (2.5, in the example).

The value of mud cake thickness is read on the dashed curves, by interpolation if necessary (¼ in., in the example).

4. Draw from "b" a horizontal line up to its intersection in "c" with the vertical scale corresponding to the value of the hole diameter (10 in., in the example). Draw from "c" a line along the trend of the oblique lines up to point "d" on the 8-in. scale (heavy line). The 8-in. scale is graduated and the location of point "d" gives the value of R_{xo} (3.7, in the example).

5. Draw from "d" a horizontal line until it crosses on point "e" the vertical scale corresponding to the value of R_{mf}—either read on the table, or measured (0.2, in the example). From "e" draw a line parallel to the oblique di-

". . . good results . . . obtained when porosity . . . higher than 20 per cent.

rection shown on the grid until it crosses the right-hand scale (heavy line) on point "f."

The values of R_{xo}/R_{mc} and R_{mf}/R_{xo} are read on the corresponding scales at the level of point "f": respectively 17 and 0.058 in the example.

6. Draw from "f" a horizontal line until it crosses the vertical scale corresponding to the value of residual oil saturation, which is supposed equal to 15 per cent in the present example (point "g"). From "g" draw a line parallel to the oblique direction shown on the grid until it reaches the right-hand scale (heavy line) on point "h."

7. Read the value of porosity at the level of "h": 25 per cent in this example. The corresponding value of the formation factor is given on the next scale, in this example 13.

Second Example (Clean Formations)

R_{mc} measured = 0.8

R_{mf} measured = 0.16

Hole diameter = 6 in.

$R_{1\ 1/2\ in.,\ inv.} = 5.5$

$R_{2\ in.,\ N} = 6$

See line a' b' c' d' e' f' g' h' i' on the chart.

Results: If the residual oil saturation is assumed to be equal to 10 per cent:

Porosity: 15 per cent

Formation factor: 36

Accuracy of the Determination

Determination of porosity from the MicroLog curves comprises two steps:

(a) Translation of the MicroLog readings into values of R_{xo}/R_{mf}.

(b) Translation of the values of R_{xo}/R_{mf} into values of porosity.

Degree of accuracy obtained in the two successive operations will now be discussed:

(a) The curves printed in the catalog were determined by means of laboratory models and of electrical circuits such that the field conditions be reproduced as closely as possible. Some differences may, however, still exist between the laboratory and the field conditions in certain cases. In particular, it may sometimes happen that the field pad does not fit exactly the diameter of the hole, which may influence the measurements to a certain extent.

It is furthermore seen on the charts that there is a region (the lower part) where the slope of the curves is very great, and even close to the vertical. If a point is plotted in this region the usual errors in the measurements of $R_{1\ 1/2\ in.,\ inv.}$ and $R_{2\ in.,\ N}$ will lead to a much greater error on the corresponding value of R_{xo}. This zone corresponds to comparatively high values of R_{xo}. Accordingly, since R_{xo} is greater as porosity is smaller, a good accuracy in the determination of R_{xo} should be expected in formations whose porosity is not too low.

The charts also show that, for a given value of R_{xo}, the thicker the mud cake, the greater the slope of the curve, but that the accuracy is not too much impaired by thick mud cakes when R_{xo} is not too great.

To define these effects, it can be said that, according to the experience available to date, good results are obtained when the porosity of the formations is higher than 20 per cent, provided the thickness of the mud cake does not exceed about 1 in. Fair determinations are still possible for lower values of porosity, down to 15 per cent and even less, if the mud cake thickness does not go beyond ½ in.

It is also recalled that the value found for R_{xo} depends on the chart chosen for the interpretations, i.e., on the value taken for R_{mc}. The accuracy in the value arrived at for R_{xo}/R_{mf} is thus finally affected by the accuracy in the determination of R_{mc} and R_{mf}. As already said, the values given in Table 1 are averages, and the exact values of R_{mc} and R_{mf} in a given case may depart from the respective averages appreciably. It is therefore advisable to measure R_{mc} and R_{mf} directly on samples taken in each case.

(b) The value of the porosity of a formation is related to the value of the formation factor through empirical formulas which are also averages of numerous determinations, and here again the true relationship in each case may be somewhat different from the average one. In addition to this, the presence of residual oil in the flushed zone is also a cause of uncertainty. Finally, the above considerations are related only to the case of substantially clean formations. In the case where the formations contain an important amount of conductive solids, additional corrections are necessary, as explained hereafter.

Case of Shaly Sands

In the case of shaly formations, the conductive solids add their conductivity to that of the network of electrolytes in the pores. If $(\phi)_e$ is the effective porosity of the formation, the value of R_{xo} is lower than it would be in a clean formation with the same porosity $(\phi)_e$. Accordingly, the porosity value derived with the charts from the MicroLog readings opposite a shaly sand is only an "apparent value," which is greater than the effective porosity of the formations.

The determination of the correction to be introduced into the value derived from the MicroLog to obtain the exact value of the effective porosity is a difficult problem, now still under study.

Pending further experimental and theoretical developments, it seems nevertheless possible to propose a provisory equation, based on purely mathematical conceptions, and applicable to the case where the conductive solids are disseminated in the pores: i.e.

$$(\phi)_e = (a \times R_{mf}/R_{xo})^{1/m} - (a \times R_{mf}/R_{co})^{1/m}$$

where R_{co} is the resistivity of the formation due to the conductive solid network only, i.e., the resistivity the formation would have if everything but the conductive solid were of very high resistivity.

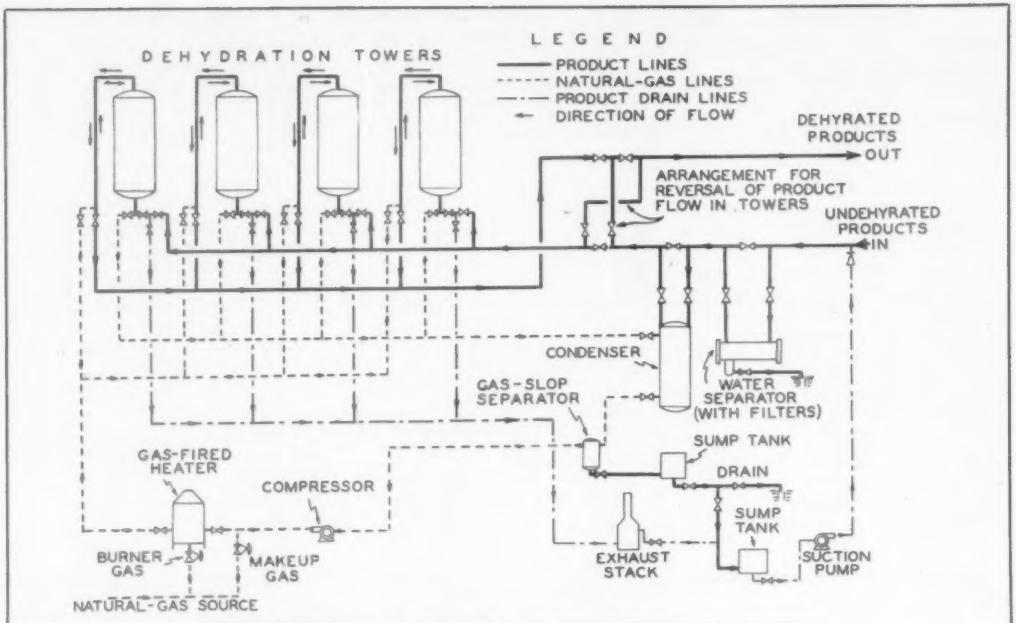
The first term of the above formula is equal to the apparent porosity, i.e., to the value given by the charts. The second term represents the value of the correction for colloids. Table 2 gives numerical values for this correction, computed with a and m being taken respectively to 0.62 and 2.15, as for the curves.

As already said, the above formula is purely theoretical and needs experimental checks. Furthermore, in the case of the presence of laminated shales, the corresponding formula would certainly be more complex, and the correction values somewhat different. Table 2 should therefore be considered as giving only orders of magnitude.

It is anyway interesting to notice that the correction is proportional to R_{mf}. In other words, the more conductive the mud, the smaller the relative effect of the conductivity of the shales on the value of R_{xo}. The use of salty mud is therefore advisable to improve the accuracy of porosity determinations in shaly sands. The salinity of the mud should not, however, be too great in order not to affect the other curves adversely, in particular the SP curve. It seems that a value of mud resistivity equal to about five times the resistivity of the connate waters would be a good compromise.

TABLE 2—TABLE OF TENTATIVE CORRECTIONS TO BE SUBTRACTED FROM THE POROSITIES OBTAINED (PER CENT), ACCORDING TO THE VALUE OF R_{mf} AND R_{co}

R_{co}	R_{mf} .01	.03	.05	.07	.09	.12	.17	.25	.35	.55	.80	1.20	1.70	2.5	3.50	5.00
20	2.5	4.0	5.0	6.0	6.5	7.5	9.0	10.5	12.0	15.0	18.0	22.0	....	....	....	....
50	1.5	2.5	3.0	4.0	4.5	5.0	5.5	7.0	8.0	10.0	11.5	14.0	16.5	20.0	....	....
100	1.0	2.0	2.5	3.0	3.0	3.5	4.0	5.0	6.0	7.0	8.5	10.5	12.0	14.5	17.0	20.0
200	1.0	1.5	1.5	2.0	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.5	8.5	10.5	12.0	14.5
500	0.5	1.0	1.0	1.5	1.5	1.5	2.0	2.5	3.0	3.5	4.0	5.0	5.5	7.0	8.0	9.5
1,000	0.5	0.5	1.0	1.0	1.0	1.0	1.5	1.5	2.0	2.5	3.0	3.5	4.0	5.0	6.0	7.0
∞	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



PROCESS FLOW diagram for Strouds, Wyo., dehydrator of Wyco Pipe Line Co. Fig. 1.

How Dehydration Curtails Corrosion . . .

. . . in pipe lines

Internal corrosion in products pipe line drastically curtailed by removal of water at inlet point.

by R. P. Dougherty*

DURING June 1950, Wyco Pipe Line Co. began dehydrating products received into the line at the Strouds, Wyo., pumping station. In so doing, Wyco became the third products pipe line to use dehydration for protection against internal corrosion.

Prior to the use of dehydrators, sediment removal averaged 716 lb. per month for 2½ years. Since that time, sediment removal has averaged 9 lb. per month. However, during the last 9 months scraper runs have brought in no sediment. Plans are now being made to run scrapers only once or twice a year for the purpose of checking the line.

*Wyco Pipe Line Co., Denver. Presented at products pipe-line conference, A.P.I. Division of Transportation, Fort Worth, 1952.

Development of Products Pipe-Line Dehydrators

In the process of manufacture of gasolines and certain distillate fuels, the products are washed with water for the purpose of removing undesirable compounds and finely divided solids that may be carried over from the treating plant. This washing is effected just prior to running the products into their respective storage tanks. Consequently, products received at the point of origin of a pipe line contain adsorbed water and water in solution. Inner surface rusting of the pipe is a direct result of precipitation of this water from the product while the product is in the line.

Much credit for the development of products pipe-line dehydrators is due Socony-Vacuum Oil Co., Inc., which pioneered the process in 1936 when it built a pilot dehydration plant at its East Providence, R. I., pumping station. With the evident success of the pilot plant, Socony immediately began construction of full-capacity plants at East Providence and Augusta, Kans. Subsequently, it has built dehydrators at Buffalo, N. Y.; Paulsboro, N. J.; Portland, Me.; and Trenton, Mich.

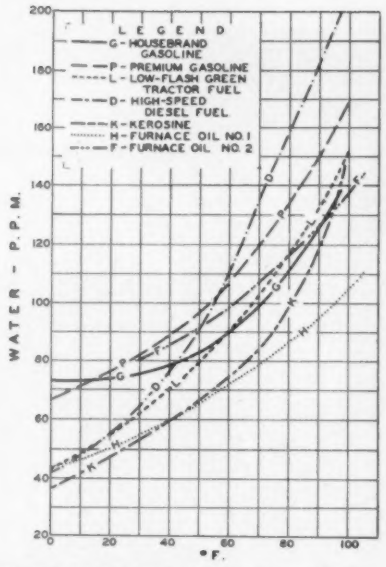
Phillips Pipe Line Co. was next to use dehydration on a products pipe line when in 1947 it began dehydrating its Borger-Denver line. Since then, Phillips has installed dehydrators on its Borger-Chicago system and now has two plants at Borger, Tex., and one at Dumas. Additional units are under construction at Paola, Kans., and Dupo, Ill.

In the fall of 1950 Standard Oil Co. (Indiana) placed in operation a dehydrator at Whiting, Ind., and began dehydrating products on its Whiting-Moorhead, Minn. line. Standard recently completed construction of a dehydrator at Neodesha, Kans., and plans to construct another unit at Sugar Creek, Mo.

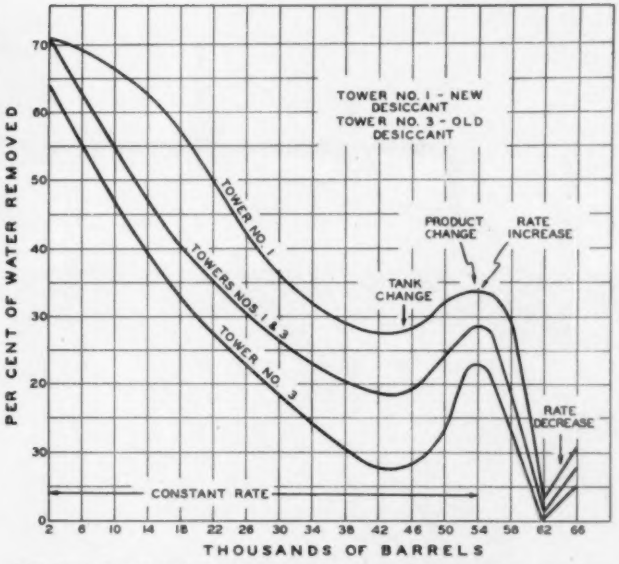
All present products pipe-line dehydrators are closely similar in most respects. This is not surprising because all of them perform the same function on the product in the same way with the same medium. All partially desiccate the product by passing it through a bed of activated alumina and all use heat for regeneration of the desiccant after it has become saturated with water.

It is only in the medium used for applying heat to the alumina bed to vaporize the water, and in the method of exhausting the adsorbed moisture from the bed that the various dehydrators differ materially.

Socony applies heat at some plants by passing superheated steam directly through the alumina bed and at others by means of steam in closed coils. Phillips passes hot butane vapor through the bed at all of its plants. Standard of Indiana uses steam in closed coils at its Whiting dehydrator, but at Sugar Creek and Neodesha regeherates with natural gas.



WATER SOLUBILITY of hydrocarbons at various temperatures. Fig. 2.



DESICCANT DEGENERATION through one dehydration cycle. Activated alumina is desiccant. Fig. 4.

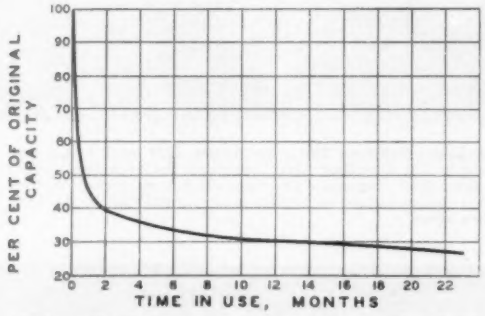
Dehydrator Operation

The Strouds dehydrator, Fig. 1, has a capacity of 20,000 bbl. per day with two towers on stream in parallel. It was designed to give full protection to the line assuming that the incoming products would be completely saturated with water at all times. Natural gas is used for regenerating the desiccant.

Flow plan . . . Incoming product first passes through an Excelso Pack water separator for removal of entrained water. Considerably more water is removed at this point during cold than warm weather, because of the greater precipitation in the incoming lines. From the water separator the product goes directly to the towers unless another tower is in process of regeneration, in which case the stream is sent through a heat exchanger to cool the gas leaving the tower which is being regenerated.

Product flow through the towers is upward. Provision is made so that flow through the towers can be reversed if desired. It was expected that unidirectional flow might so compact alumina fines and accumulated sediment that pressure differential across the towers would become excessive. If such a situation occurred, reversed flow would dislodge and disperse the fines and sediment, thereby reducing the pressure drop through the towers. To obtain proper operation of the Strouds pumping station, pressure drop across the dehydrator should not exceed 40 psi.

With the pressure drop across the auxiliaries reaching 20 psi., at times, a maximum of 20 psi. drop across the towers is allowable. Inasmuch as the greatest drop recorded to date across these towers has been 5 psi., it has never been necessary to back flush the desiccant. Winnowing the desiccant to remove dust and fines prior to placing it in the towers will help to keep the pressure drop down by reducing the amount of fines available to pack the voids in the desiccant bed.



ADSORPTION CAPACITY DECLINE for 8-14 mesh activated alumina. Fig. 3.

When two or more towers are on stream it is desirable that the flow through the towers be equalized. This is accomplished by installing a flow meter on the intake line to each tower, thus enabling the operator to balance the flow by manipulation of the tower intake valves.

To determine the effectiveness of the dehydrator, samples are taken frequently of the incoming and outgoing streams and titrated for water content by the Karl Fischer titration. The curves in Fig. 2 show the parts per million of water required to saturate the several products at various temperatures. From the curves it is evident that the temperature of a product determines the amount of water that that product will adsorb.

It is the purpose of this dehydration to lower the water content below saturation at the lowest temperature the product will encounter while in the pipe line. This temperature is referred to as "low line temperature." Further dehydration below this point will not further protect the line, but will add only a factor of safety to the protection. It is, of course, not possible to dehydrate at an even rate throughout the period that towers are on stream.

After determining the p.p.m. of water in the outgoing product and the low-line temperature, reference to the curves shown in Fig. 2, will indicate whether the towers may be continued

Line-up of four Cooper-Bessemer GMV, 10-cylinder, 1100 hp V-angle compressors installed in The East Ohio Gas Company's Robinson Station near North Canton, Ohio. Units compress gas from 400 pounds suction to 1,160 pounds discharge for underground storage and transmission to the company's marketing areas.

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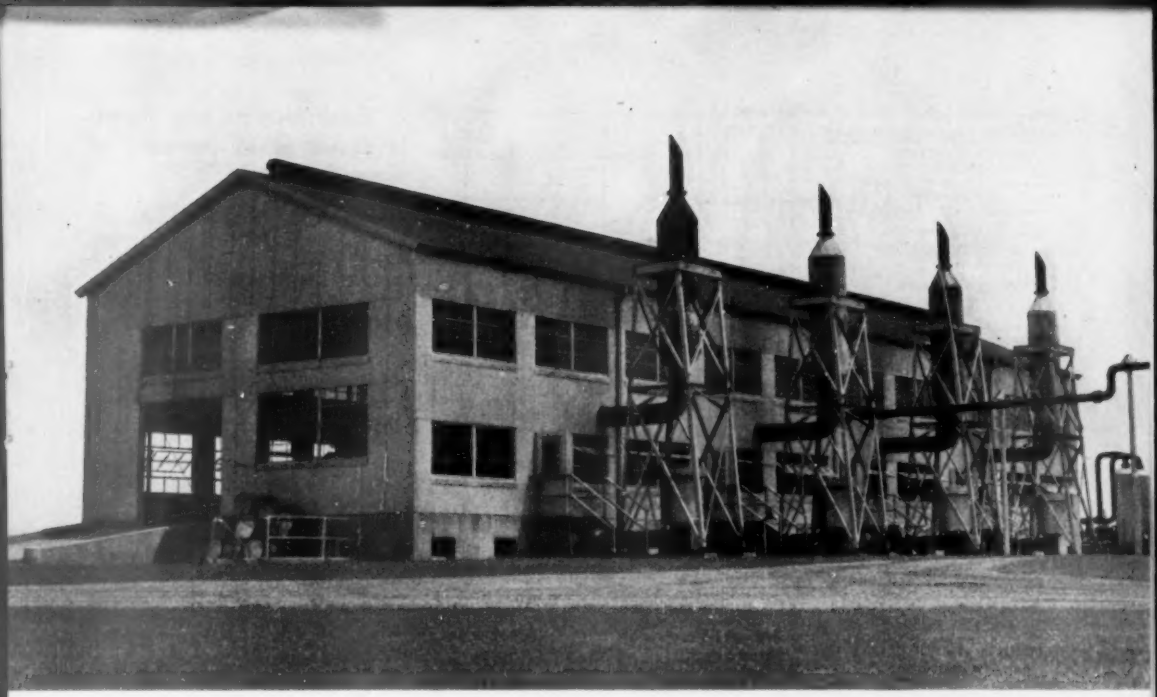

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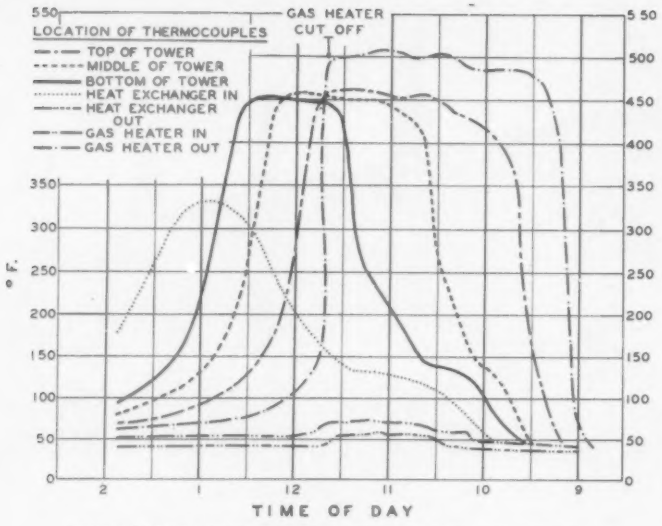


TEMPERATURE CURVES through one regeneration cycle. Fig. 5.

on stream. If the p.p.m. water in the dehydrated product falls above the curve for that particular product at the low-line temperature, water will precipitate into the line, and the towers must be changed immediately. However, towers are actually changed before they reach this point.

The length of time that a pair of towers can be left continuously on stream without regeneration varies considerably because of the many factors which affect it. For example, if the temperature of the incoming product is near the low-line temperature and the product is saturated with moisture, a comparatively small amount of water must be removed to assure protection of the line. On the other hand, if the temperature of saturated product is much higher than the low-line temperature, a greater amount of water must be removed and regenerations must necessarily be more frequent.

It is possible, and sometimes happens, that even though the incoming temperature is above the low-line temperature, the product is well below the point of water saturation. When this condition exists, the product can be cooled several degrees without moisture precipitation, and it may not be necessary for the desiccant to remove any water at all. A similar situation occurs when the low-line temperature is higher than the temperature of the incoming product.

However, regardless of whether actual dehydration of adsorbed water is required, products are always routed through the entire dehydration plant to assure that no free water is ever allowed to reach the pipe line. Other factors affecting the frequency of regeneration are pumping rate, percentage of water saturation of the product, condition of the desiccant, and type of refined product being pumped. We have noticed that when dehydrating distillate fuels, more frequent regenerations of the desiccant are apparently required than when dehydrating gasolines.

Regeneration . . . Towers are regenerated as soon as possible after taken off stream. In the regeneration cycle the towers are first emptied of product while being simultaneously filled with gas. Inasmuch as the suction pressure to the main line pumps can be reduced below 80 psi. and also since 80 psi. is maintained on the natural-gas lines, it is a simple expedient for the operator to admit gas into the top of the tower and force the product down and out into the intake line leading to the towers on stream.

As soon as the first bubble of gas appears in the test connection at the bottom of the tower, the product intake valve to that tower is closed and the tower is allowed to rest for about an hour to permit holdup products to drain down. This holdup stock is then drained to the sump through the gas eliminator and the tower is ready for regeneration.

Next the compressor is started and the gas heater turned on. The hot gas, maintained at 500° F. at the heater outlet, passes downward through the desiccant bed and vaporizes the adsorbed water and any remaining holdup stock. The mixture of gas and vapors leaving the towers is routed through the heat exchanger where it is cooled to approximately 100° F., condensing out the holdup stock and water which are collected in and decanted from the gas-slop separator or "knockout drum."

"Fresh alumina can absorb in excess of 12 per cent of water by weight."

The slop, or water-product mixture, flows to an aboveground slop tank where it is allowed to settle for a short time. Then the water is drained off to a dry well and the product allowed to flow into the sump tank. Products in the sump tank are pumped back into the dehydrator intake line so that no undehydrated product enters the pipe line. The sump tank is always pumped out while the same product is on stream as is in the tank in order to prevent any possible contamination.

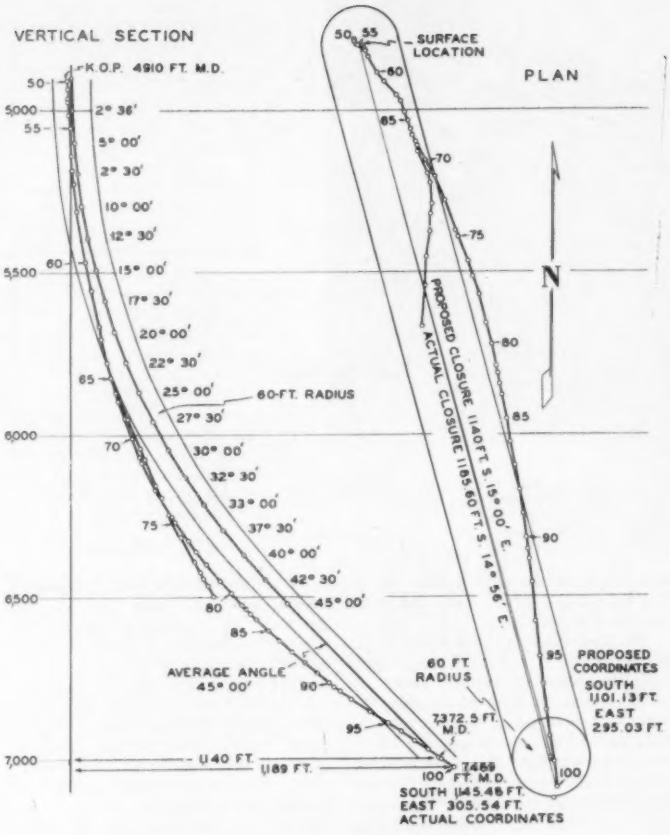
From the knockout drum the liquid-free gas reenters the compressor where it is recompressed to recover the pressure lost in passing through the system. The process is continued until the entire bed has been heated to 375° F. At this point the heater is turned off but the gas circulation through the tower is continued until the bed temperature is lowered to about 100° F.

The cycle is then complete and valves are closed leaving the tower full of gas. It usually takes between 2 and 3 hours to raise the desiccant bed in one tower to 375°, and between 1½ and 2 hours to cool the bed after the burner has been cut off. To refill the tower with product, it is only necessary to turn product into the bottom of the tower and vent the gas to atmosphere through the gas eliminator or "stack."

Replacement of desiccant . . . Activated alumina gradually loses its affinity for water with use. New alumina will remove considerably more water than material which has been regenerated many times. Actually the curve of adsorption capacity of the alumina drops rapidly during its first several regenerations and then assumes a more gradual slope toward the end of its usefulness.

Fresh alumina can adsorb in excess of 12 per cent of water by weight, but after the initial regenerations the adsorption capacity drops off to approximately 4 per cent. To provide a workable factor of safety, the Strouds dehydrator was designed on the basis of 2.5 adsorption. Fig. 3 shows the curve of decline in adsorption capacity of 8-14-mesh alumina.

(Continued on page 157)



Left: Plan of the special directionally drilled Spraberry well. Above: Core of Spraberry sand, broken at fracture plane.

WELL COMPLETIONS IN THE SPRABERRY SAND

Special Directional Drilling in West Texas

Humble drills a 7,000-ft. measured-depth directionally deviated hole in the Pembrook area of Spraberry trend

by Roy F. Carlson
West Texas District Editor

PRODUCTION in the Spraberry sand reaches the well bore largely by means of extensive vertical fractures which are generally agreed to be in a pattern, running in the same general direction. Therefore it is supposed that if a maximum of these fractures can be connected with the well bore, the better the well will be when it is placed on production. This has been the basis for the extensive shooting or sand-gel fracturing program in effect in virtually all wells of the trend.

Directional drilling of a well in the relatively hard rocks of West Texas is a different problem from that in soft-formation areas.

A 7,000-ft. measured-depth directionally deviated hole drilled by Humble Oil & Refining Co. in the Pembrook area of the Spraberry trend has illustrated the differences and yielded solution to the problems the hard rocks cause.

The fractures were also behind Humble's drilling the directional hole. If the well bore could be deflected to a horizontal direction to intersect the fractures perpendicularly the well bore would traverse a maximum number of them while in the allowed target area in a given 40-acre location.

As an approach to the horizontal ideal direction, Humble planned to go through the upper Spraberry sand at about a 45° angle and get 1 ft. of horizontal penetration for every foot of vertical penetration. Actually an even higher angle was obtained as will be shown.

Preparations

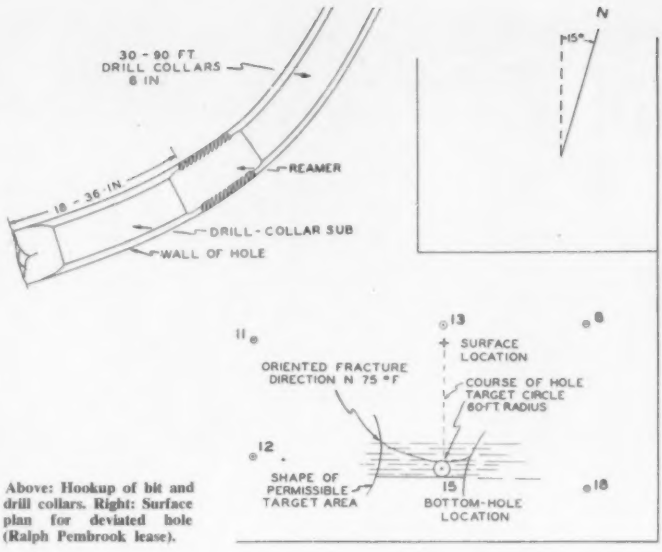
Before the well was even begun, it was necessary to determine the dominant fracture pattern. Oriented cores were taken in eight different wells in the vicinity of the proposed directional hole, and with one exception these showed that the dominant fracture pattern trended about N. 75° E. Therefore the well would

Special plan needed for directional drilling in Spraberry.

have to be drilled in a N. 15° W. direction. Orientation work and later directional drilling were directed by Eastman Oil Well Survey Co.

Core orientation was done by the Corex method, involving the use of a special orienting sub above the core barrel, a special go-devil, and hole-surveying equipment. The sub and go-devil orient the core with regard to the low side of the hole, and the directional-surveying tools show the direction of the hole. With this information, the position of the core with regard to the surrounding rock can be determined to give the core orientation.

Once the direction of the fractures was determined, with the depth to the top of the Spraberry known, it was necessary to develop a plan for developing the deviation angle in the well and to move the surface location of the well so that the well would bottom in the proper area in accordance with field rules in the Pembrook area. The plan is shown on accompanying drawings, along with the path the well bore actually followed.



Above: Hookup of bit and drill collars. Right: Surface plan for deviated hole (Ralph Pembrook lease).

Making the Surface Location

It was necessary to make the surface location for the well about 1,200 ft. N. 15° W. of the normal bottom-hole location to have the well bore in a plane at right angles to the fractures. The target area was described as a circle with a 60-ft. radius, although according to field rules, the permissible target area would have been irregularly shaped.

Plans for the hole included setting 13⅜-in. surface casing, a 9⅝-in. intermediate string, and an oil string of 5½-in. casing. The oil string was set through the pay in accordance with Humble's regular Spraberry completion method.

Drilling Begins

Drilling was begun on November 27, 1951, and surface casing was run and cemented the next day at 338 ft. A 12¼-in. hole was drilled below the surface pipe and the intermediate string was set at 4,149 ft. An 8¾-in. hole was drilled from there to total depth.

It was in the 8¾-in. hole below the intermediate casing string at 4,910 ft. that the directional drilling began. This first 4,910 ft. of hole was drilled in 20 days. The hole to that point was surveyed in one unit by a multiple-shot surveying instrument to accurately determine the location of the bottom of the hole. Once this was done, deflection of the hole in the correct direction was begun. Directional drilling began December 17, 1951, with the hole bottomed in shale.

The first whipstock was set at 4,910 ft. as measured along the bore hole, with the hole off vertical about 1° at that point. In most cases when the whipstock was set, a 6¼-in. bit was used to drill off of the tool for 20 ft. or so with the hole then being reamed to full diameter of 8¾-in. For the first portion of the deviated hole, 4-in. drill pipe was used, with 3-in. pipe being picked up for the last part of the drilling.

The drift angle was scheduled to be increased at the rate of 2° 30′ per 100 ft. drilled. Almost immediately after setting the first whipstock, the hole began drifting off course to the east. At the true depth of 6,500 ft. the direction had been corrected but the drift angle had fallen behind schedule to the extent that it could not be built up to the desired amount in the remaining hole to be drilled. It was therefore necessary to plug the hole back and try again.

Plugging Back

Just above the point of plug back, at a depth along the hole of 6,545 ft., the bottom of the hole was displaced 391 ft. south and 101 ft. east of the surface location. True vertical depth at this point was 6,426 ft.

The hole was plugged back from 6,618 to 5,914 ft. using a cement-sand slurry. Attempts to drill the new hole out of the old hole off a whipstock failed, so that the hole was plugged back further.

In this second plug back, 90 sacks of cement were used with 12 lb. of sand per sack. This operation brought the top of the cement to 5,800 ft. where another whipstock was set.

This second plug back was successful, deviation out of the old hole being done with a corehead for 15 ft., the latter being reamed to full diameter. Just off this whipstock at 5,848 ft. along the hole, deviation was 18° off vertical in a direction S. 18° E. Traces of the old and new hole are shown on the accompanying illustrations.

The 4-in. drill pipe was used to a depth of 6,612 ft. when it was laid down and 3-in. drill pipe was picked up. Beyond this point deviation of the hole was well under control and hole was bottomed within 10 ft. of the center of the target area at a vertical depth of 7,000 ft. The well was drilled another 30 ft., however, which deviated the bottom of the hole another 49 ft.

Since the rate of buildup of drift angle fell behind schedule it became necessary to reach a higher final angle than the 45° originally planned. As a result, the maximum angle reached just prior to drilling the pay was 58°, with an average angle through the pay of about 55°.

Coring In

Coring was started at 7,243 ft. measured depth and continued to total depth of 7,489 ft. Full core recovery was obtained in coring this 246 ft., 127 ft. of which was through the pay. No unusual difficulties were experienced in coring, or in subsequent running of

5½-in. casing to bottom. A total of 129 days were used to set the oil string. About 48 days were used to where it was necessary to plug back the first deviated hole.

In drilling the hole, 18 whipstocks were used, including a knuckle joint set when drilling out of the old hole after plugging back. Record of the deviation of the hole was kept using 50 shots with the multiple-shot tool above the kickoff point, and 50 shots with a single shot instrument during the directional drilling operation.

The course of the hole at total depth of 7,489 ft., measured along the hole, was trending in a direction S. 14° 56′ E., 4′ off of the proposed course of S. 15° E. Course of the hole is the direction of the line connecting the top and bottom of the hole. Vertical depth at the bottom of the hole was 7,029.90 ft. with a deflection of 1,144.6 ft. south and 305.4 ft. east of the surface location. Actual direction of the hole at the last surveyed point was S. 8° E.

Unusual Equipment

When the first try was made at deflecting the hole, the behavior of the drilling was contradictory to experience in areas where directional drilling is commonplace. Normally the bit tends to climb up and to the right of the deviated hole, causing a drift of the hole in that direction. In the Humble well just about the reverse was true.

To correct for this trouble engineers tried several variations of what is known as the "limber hookup" of drill pipe, reamers, and bit but failed to correct the unusual drifting tendency. After much trial a "stiff" hookup was used which eliminated use of drill pipe near the bit and substituted drill collars instead. A drawing of the stiff hookup is shown here.

The drilling was carried on with considerable weight on the bit also, a practice a bit different from normal in directional drilling. This weight, however, apparently acts as a fulcrum when weight is placed on the drilling string, and forces the bit up against to top side of the hole to help in building up angle in drilling.

BOOKS

SPINDLETOP. By James A. Clark and Michel T. Halbouty. Published by Random House, New York. 306 pp. $3.95.

This book is one of a limited printing produced especially for sale in Beaumont, Tex., home of Spindletop field. The story is that of the oil discovery that "changed the world —of the events leading up to it and the boom days that followed. It is a fascinating tale of men against odds, and the incidents which molded men and ideas together to form the nucleus of the modern oil industry."

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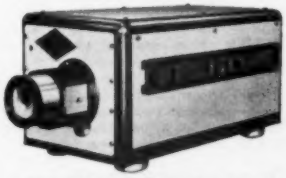

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WRITE FOR BULLETIN 1025A

A REPORT TO THE WHITE HOUSE...

1— Forecast for Petrochemicals

From "A Report to the President of the United States by the President's Materials Policy Commission, June 1952."

A LONG-RANGE, nation-wide survey of the petroleum chemical industry has been made by Standard Oil Development Co., in cooperation with the Chemical Products Department of Esso Standard Oil Co. This survey has attempted to establish the trends and requirements of the entire petrochemical industry at 5-year intervals from 1955 through 1975.

Specifically, these requirements embrace (1) petroleum and natural gas raw materials, and (2) investments for new petrochemical plants.

The long-range supply picture for olefins and aromatics, the chief building blocks for petroleum-derived chemicals, is good. Butylenes are perhaps in tightest supply. Here petrochemicals must compete with aviation gasoline which requires butylene alkylate. However, in the long run, the increasing use of jet fuel is expected to ease the situation.

A comfortable surplus of butylenes is indicated by 1975. The natural-gas requirements excluding fuel needs for such chemicals as ammonia, methanol, ethylene, acetylene, etc., amounts to only 2.3 per cent of the probable 1975 consumption.

Basis for Long-Range Forecast...

AS a basis for the long-range forecasts of petrochemicals requirements, it has been assumed that the industry will develop under an "armed peacetime" economy, but without an open war. And it is also assumed that the industry's growth will be commensurate with an expanding population and an increasing standard of living. No allowance has been made for any serious economic recession.

Furthermore, it is assumed that petroleum will continue to increase in importance as a source of energy requirements. Also no allowance has been made for any byproduct chemicals from synthetic liquid fuels manufacture. In the event of a crude-oil shortage it is believed that, from a strictly economic standpoint, the use of shale oil would precede truly synthetic fuel. The results of this survey are applicable if shale is used to augment crude-oil supplies, excepting that byproduct ammonia from shale processing would reduce the amount required from natural gas.

Petrochemicals, even in 1975, probably will be a relatively minor consumer of petroleum and natural gas. The petroleum hydrocarbon raw material consumed in producing petrochemicals in 1975 is equivalent to only 2 per cent by weight of the probable domestic petroleum and natural-gas requirements. It is only 2.7 per cent by weight when including liquid hydrocarbons degraded to fuel gas.

When including all fuel for the operation of the petrochemical plants, the total hydrocarbon requirements are only 5.5 per cent of the petroleum and natural-gas requirements. The comparable 1950 figures are estimated to be about 0.7 and 1.9 per cent by weight. The 1975 requirements allow for a phenomenal growth of the plastics industry based on the forecasts of demand supplied by the commission.

No major war... It is assumed that the petrochemical industry will develop under the conditions of armed peacetime economy which prevail today. It is further assumed that this country's major rearmament effort will be completed by 1955.

Synthetic fuel not a major factor... It is assumed that there will be no major construction of a synthetic-fuels industry. Consequently, no allowance has been made for any significant quantity of byproduct petrochemicals being derived from synthetic-fuels manufacture.

Type of raw materials from refining operations unchanged... Increased and more severe catalytic cracking plus catalytic reforming of heavy virgin naphtha will provide for the higher octane gasoline requirements of future automotive vehicles. Thus, increased supplies of hydrocarbon raw materials such as propylene and butylenes will become available as gasoline requirements increase.

Present-type petroleum products... No allowance has been made for the development of radically new types of automotive fuel which might render existing processes obsolete, e.g., the use of jet fuel or liquefied petroleum gases. Furthermore, it is assumed that the use of synthetic lubricants will not be a major factor.

Present energy sources... It is assumed that the use of atomic, solar, and tidal energy will not be a major factor affecting the consumption of petroleum and natural gas.

No severe economic depression... It is assumed that the requirements for petroleum, and the end-use products derived from petrochemicals, will enjoy a normal growth as determined by an expanding population and the increasing standard of living of the people.

Unforeseen technological developments would not alter conclusions... It is assumed that such technological developments would not affect the requirements of petroleum for petrochemicals nor the predicted investments within the accuracy of these figures.

End-Uses of Petrochemicals

Petrochemicals have been classified according to end use into eight groups. The end-use groups are listed below together with some of the major products included therein.

Synthetic fibers... Nylon, Dacron, acrylic, other synthetics, and cellulosics (acetate rayon).

Synthetic rubbers... Buna-S types, butyl, neoprene, and nitrile (Buna-N).

Plastics, resins, and plasticizers... Polyethylene, alkyds, vinyls, polystyrene, phenolics (urea and melamine), cellulosics, and other.

Protective coatings (including solvents)... Aromatics, alcohols, ketones, glycerine, and other.

Automotive chemicals... Tetraethyl lead fluid and other additives, antifreezes, and hydraulic fluids.

Nitrogen products (including fertilizer), detergents, and miscellaneous items... Insecticides, herbicides, dyes, and miscellaneous solvents.

All of these end products may be derived from a relatively small number of hydrocarbon intermediates and primary products. These are listed in Table 2 together with the principal source of each.

Hydrocarbon intermediates are those reactive petroleum derivatives, such as acetylene, ethylene, propylene, butylenes, etc., which normally are not considered as petrochemicals. Primary products, or petrochemicals, have been defined, for the purposes of this survey, as those chemicals which are derived directly from (a) the hydrocarbon intermediates, (b) natural gas, or from (c) selected petroleum fractions.

In most cases the primary products selected represent those petroleum derivatives which usually are or could be considered as natural adjuncts to a petroleum company's business. This may involve carrying the process steps beyond the true primary product. For example, in Table 2 both ethylene oxide and ethylene glycol are listed as primary products. Naturally, it is logical for the same manufacturer to make both the glycol and the oxide.

Requirements of natural gas and petroleum for chemicals are detailed in Table 3. The supply picture in 1975 for these major hydrocarbon raw materials and hydrocarbon intermediates would appear to be as follows:

Natural gas . . . Some 14.3 billion pounds annually of methane, ethane, and higher paraffins will be needed for the manufacture of ammonia, methanol, ethylene, acetylene, etc., in 1975. This represents only 2.3 per cent of the probable domestic consumption of natural gas by then.

Ethylene . . . Ethylene is a byproduct of refinery cracking operations, notably catalytic cracking. Some ethylene is produced by destructive liquid cracking processes. However, the greater part of the 8 billion pounds a year of ethylene required in 1975 probably will be supplied by thermally cracking ethane. A large part of the ethane required can be obtained from refinery fuel gases while additional supplies, as will be noted from Table 3, must be recovered from natural gas.

Conservatively allowing 5 per cent of ethane in natural gas, it is estimated that less than 10 per cent of the potential ethane would be required, based on the probable 1975 domestic natural-gas consumption.

Propylene . . . This is obtained entirely as a byproduct from refinery cracking operations, mainly catalytic cracking. It is roughly estimated that 2.8 billion pounds a year will be required in 1975. This compares with a predicted production of around 25 billion pounds a year. The competing fuel products uses of propylene are catalytic polymer for motor gasoline and alkylate for aviation gasoline.

As the requirements of propylene for chemicals consume only 11 per cent of the potential production, the supply outlook is considered to be very favorable.

Butylenes . . . Like propylene, butylenes are a byproduct of refinery cracking processes. In contrast to predicted 1975 requirements for butylenes of about 3.4 billion pounds (16 million barrels) including about 0.4 billion pounds degraded to fuel gas, the probable production is about 28 billion pounds (132 million barrels).

Alkylate requirements for aviation gasoline, when making allowances for the use of jet fuel in the larger part of the military and commercial aircraft by 1975, are estimated to require from 20 to 25 per cent of the butylenes pro-

TABLE 1—RAW MATERIALS AND INVESTMENT REQUIREMENTS FOR PETROCHEMICAL END USES

By the end of—	Millions of pounds per year					
	1955	1960	1965	1970	1975	
Hydrocarbon raw materials to products and losses:*						
1. Synthetic fibers	1,560	1,810	2,010	2,330	2,540	
2. Synthetic rubber	1,980	2,270	2,590	2,790	3,130	
3. Plastics	3,410	6,910	10,440	13,920	17,540	
4. Surface coatings	1,150	1,510	1,830	2,180	2,530	
5. Automotive chemicals	1,300	1,490	1,670	1,820	1,930	
6. Nitrogen products	1,430	2,220	2,830	3,430	4,040	
7. Detergents	580	750	860	970	1,020	
8. Miscellaneous†	3,630	4,350	4,850	5,420	6,050	
Total	15,040	21,310	27,080	32,860	38,780	
Hydrocarbon liquids degraded to fuel gas‡	3,880	6,540	9,200	11,840	14,450	
Total hydrocarbon raw materials	18,920	27,850	36,280	44,700	53,230	
Investments (incl. offsites and utilities¶)	Millions of dollars					
for 5-year periods ending—	1955	1960	1965	1970	1975	Total
1. Synthetic fibers	83.6	51.5	34.7	46.6	26.7	243.1
2. Synthetic rubbers	176.1	135.9	114.2	94.4	113.9	634.5
3. Plastics	323.7	497.9	519.0	556.1	572.8	2,469.5
4. Surface coatings	48.7	38.9	36.3	37.1	38.3	199.3
5. Automotive chemicals	135.0	101.0	81.9	77.5	69.2	464.6
6. Nitrogen products	12.4	131.9	121.5	122.4	123.4	511.6
7. Detergents	14.7	9.5	8.0	4.8	6.8	43.8
8. Miscellaneous†	148.5	151.4	116.1	115.4	103.7	635.1
Total	942.7	1,118.0	1,031.7	1,054.3	1,054.8	5,201.5

*Cumulative requirements for both new and existing capacity—represents hydrocarbon going into products, byproducts and losses. †Includes insecticides, herbicides, dyes, miscellaneous solvents, etc. ‡This represents butane and heavier hydrocarbons which are degraded to fuel gas. ¶Investments are for June 1950 construction costs. A breakdown between onsite, offsite, and utilities is given in Table 3. The investment coverage is about 89 per cent for primary products and ethylene. No investments are included for any end products excepting synthetic rubber.

TABLE 2—PRIMARY PETROCHEMICAL PRODUCTS AND HYDROCARBON INTERMEDIATES, PETROCHEMICAL INDUSTRY, U.S.A., 1955 TO 1975

Primary products and hydrocarbon intermediates—	Principal source
Acetic acid‡	Natural gas (by direct oxidation)
Acetylene*	Natural gas
Ammonia*	Natural gas
Amyl alcohol	Cracked naphtha
Benzene*	Virgin naphtha
Normal butylene†	Refinery cracking operations
Butadiene*	Normal butylenes
Secondary-butyl alcohol*	Normal butylenes
Cresols and cresylic acid	Certain virgin and cracked naphthas
Cumene (for oxidation to phenol)*	Propylene-benzene
Cyclohexane*	Virgin naphtha
Cyclopentadiene	Severe thermal cracking of oils
Chloroethane	Natural gas
Ethanol*	Ethylene
Ethyl acetate§	Ethylene
Ethyl chloride*	Ethylene
Ethylene dichloride*	Ethylene
Ethylene dibromide*	Ethylene
Ethylene oxide‖*	Ethylene
Ethylene glycol*	Ethylene
Ethylene*	Refinery cracking operations plus natural gas¶
Glycerine*	Propylene
Hydrogen cyanide	Natural gas
Isobutylene*	Refinery cracking operations
Isoprene	Severe thermal cracking of oils
Isopropanol*	Propylene
Methanol*	Natural gas
Methyl chloride	Natural gas
Methylene chloride	Natural gas
Naphthalene*	Heavy naphtha
Naphthenic acids†	Heavy naphtha (certain crudes)
Nitroparaffins	Natural gas
Polyethylene	Ethylene
Polypropylene	Propylene
Propylene†	Refinery cracking operations
Styrene*	Ethylene-benzene
Toluene*	Virgin naphtha
Xylenes*	Virgin naphtha
Other aromatics†	Refinery cracking operations
Vinyl chloride*	Ethylene

*Investments have been included. †No investments are required. ‡Exclusive of acetic acid made from ethanol. ¶Some ethylene will be recovered from catalytic cracking gas and from high temperature severe thermal cracking of oils; most of it will be produced by cracking ethane obtained from refinery gases and natural gas. §Exclusive of ethyl acetate made from ethanol. ‖Primary product for uses other than ethylene glycol.

duced. Butylenes requirements for alkylate can be reduced by alkylating propylene and pentenes. And butylenes requirements for synthetic rubber can be reduced by manufacture of butadiene from normal butane.

With this flexibility, the butylenes supply situation in 1975 is believed to be quite satisfactory. The situation will be somewhat tighter over the next few years because of the growing military needs for aviation gasoline. However, for 1955-60, the butylenes required for aviation alkylate would appear to require only 30 to 40 per cent of the probable production.

Aromatics . . . There appears to be more than ample raw materials to produce the tremendous demand for aromatics predicted by 1975. The major share of this is benzene, most of which will be required for plastics. Toulene, xylenes, and naphthalene likewise will increase in demand several-fold within the next quarter century. Surface coatings will be the principal consumer of these aromatic chemicals.

The lower aromatics may be synthesized in several different ways and from various petroleum components. It is outside the scope of this study to forecast the utilization of aromatics raw materials from the standpoint of economics. However, the most important method today is dehydrogenation of naphthenes by catalytic reforming of selected virgin naphtha fractions.

Isomerization to convert methylcyclopentane to cyclohexane may be integrated with low-pressure catalytic reforming to maximize benzene. Similarly, in producing toluene, the dimethylcyclopentane must be isomerized first to methylcyclohexane.

Isomerization and dehydrogenation can be made to proceed simultaneously. This is done by the "hydroforming process" under relatively high pressures and in the presence of recycled hydrogen. Supported molybdenum, tungsten, chromium, or platinum catalysts are employed.

Two process improvements in hydroforming are (a) Platforming, which uses a platinum catalyst at high pressure, and (b) "fluid" hydroforming, which uses powdered catalysts containing molybdenum or other metals at lower pressure. Both Platforming and two-step isomerization - hydroforming are used commercially today.

Based on potential raw materials, catalytic cyclization of normal hexane to

TABLE 3—CLASSIFIED PETROLEUM AND NATURAL-GAS REQUIREMENTS FOR CHEMICALS

(Millions of pounds annually)

	1955	1960	1965	1970	1975
Natural gas*—					
Uses other than ethylene†	4,830	6,640	8,100	9,680	11,150
Ethylene from natural gas	1,510	2,070	2,500	2,880	3,120
Total natural gas	6,340	8,710	10,600	12,560	14,270
Petroleum*—					
Ethylene:					
To product and losses	1,510	2,380	3,230	4,020	4,940
Degraded to fuel gas‡	490	620	760	890	1,020
Total consumed	2,000	3,000	3,990	4,910	5,960
Propylene	1,640	1,980	2,280	2,580	2,820
Butylenes and butanes:					
To product and losses	1,880	2,140	2,450	2,680	3,040
Degraded to fuel gas	390	420	420	390	380
Total consumed	2,270	2,560	2,870	3,070	3,420
Pentenes, pentanes and higher	540	650	740	900	1,060
Aromatics:					
To product and losses	3,130	5,450	7,780	10,120	12,650
Degraded to fuel gas	3,000	5,500	8,020	10,560	13,050
Total consumed	6,130	10,950	15,800	20,680	25,700
Summary:					
Natural gas consumed	6,340	8,710	10,600	12,560	14,270
Petroleum to product and losses	8,700	12,600	16,480	20,300	24,510
Total natural gas and petroleum to product and losses	15,040	21,310	27,080	32,860	38,780
Petroleum degraded to fuel gas	3,880	6,540	9,200	11,840	14,450
Total hydrocarbons consumed	18,920	27,850	36,280	44,700	53,230

*Cumulative requirements for both existing and new petrochemicals production. †Includes some higher paraffins than methane and ethane. ‡Associated with destructive cracking of liquid petroleum fractions.

TABLE 4—END-USE REQUIREMENTS OF PRIMARY PRODUCTS AND HYDROCARBON RAW MATERIALS, PETROCHEMICAL INDUSTRY—U.S.A.—1955 TO 1975

(Millions of pounds annually)

	1955		1960		1965		1970		1975	
	P.P.	H.C.	P.P.	H.C.	P.P.	H.C.	P.P.	H.C.	P.P.	H.C.
1. Synthetic fibers	1,530	1,560	1,820	1,810	2,100	2,010	2,470	2,330	2,740	2,540
2. Synthetic rubbers	2,290	1,980	2,600	2,270	2,960	2,590	3,180	2,790	3,510	3,130
3. Plastics and plasticizers	4,510	3,410	9,450	6,910	14,460	10,440	19,320	13,920	24,670	17,540
4. Protective coatings	1,180	1,150	1,560	1,510	1,870	1,830	2,230	2,180	2,590	2,530
5. Automotive chemicals	2,180	1,300	2,550	1,490	2,890	1,670	3,150	1,820	3,400	1,930
6. Nitrogen products	2,720	1,430	4,210	2,220	5,370	2,830	6,500	3,430	7,670	4,040
7. Detergents	660	580	830	750	940	860	1,060	970	1,100	1,020
8. Miscellaneous	5,170	3,630	6,220	4,350	6,880	4,850	7,700	5,420	8,500	6,050
Primary products	20,240		29,240		37,470		45,610		54,180	
Hydrocarbon to products and losses		15,040		21,310		27,080		32,860		38,780
Liquid hydrocarbons degraded to fuel		3,880		6,540		9,200		11,840		14,450
Total hydrocarbons consumed		18,920		27,850		36,280		44,700		53,230

P.P. = Primary petrochemical products. H.C. = Hydrocarbon raw material consumed (includes normally liquid petroleum fractions which are degraded to fuel gas).

benzene and normal heptane to toluene may be important processes in the future. Another possible synthesis is dealkylation of alkylated aromatics. Some aromatics are available as byproducts from severe high-temperature cracking of oils for the production of unsaturates.

Catalytic naphtha contains only small amounts of benzene and toluene and has not been of much interest. Also crude oils contain benzene and toluene in small amounts. Benzene contents range from 0.001 to 0.4 per cent. Special recovery of these lower aromatics from crudes is likely to be of economic interest only when combined with aromatics synthesis operations.

All of the above syntheses require a further processing step to purify the aromatics for use as chemicals. The contaminants may be saturated hydrocarbons or they may be olefins and diolefins. Extractive distillation, solvent extraction, and silica gel adsorption are the present commercially available techniques.

Returning to the question of aromatics supply, it would appear that the potential benzene supply, through the various routes described, could be four or fivefold the predicted 1975 demand. In the case of toluene and xylenes, aviation gasoline will require a share.

However, after satisfying probable aviation requirements it is estimated that chemicals will require less than 10 per cent of the remainder. This is an important consideration from the standpoint of meeting future motor-gasoline quality.

Forecasts

The estimated hydrocarbon raw-material requirements for petrochemicals have been based on forecasts of petrochemicals, together with end-use patterns, which were prepared by the Chemical Products Department of Esso Standard Oil Co. These are summarized in Table 4. Estimated future requirements of synthetic fibers and plastics were supplied by N. M. Elias of the President's Materials Policy Commission and are understood to represent a concensus of industry.

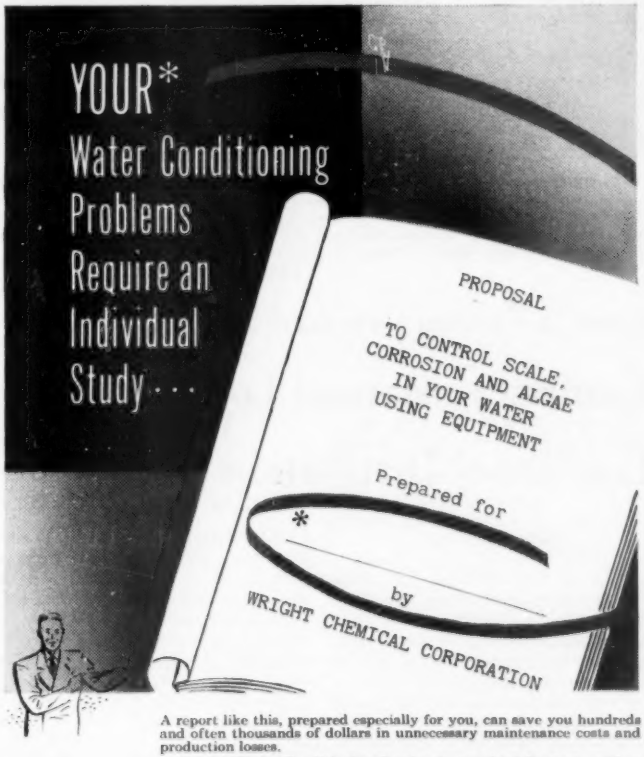
These two end-use groups have determined the forecasts of many of the major petrochemicals. Notably, ethylene and benzene requirements are markedly sensitive to changes in the plastics picture. Approximately one-half of the hydrocarbon raw materials requirements in 1975 are for resins and plastics.

Referring to Table 4, it should be appreciated that the quantity of primary products shown for a particular end-use group is not the quantity of end-use products. Also it should be understood that these primary products represent only those derived from petroleum and natural gas.

It will be noted that for most end-use groups the weight of the primary products is greater than the weight of the hydrocarbon raw material. The general explanation of this, which applies to all groups excepting synthetic rubber, lies in the fact that many of the primary products are formed by the addition of nonhydrocarbon material to the hydrocarbon. As examples the various alcohols, ethylene oxide, ethylene glycol and glycerine, all include oxygen; other products include chlorine or bromine.

Styrene is considered as a primary product of ethylene. However, the benzene going into styrene includes a proportionate share of coal tar benzene.

The only other duplication in primary products occurs in the case of cumene, which is made by alkylating benzene with propylene. Both cumene and benzene are primary products. However, there are no duplications in hydrocarbon raw materials.



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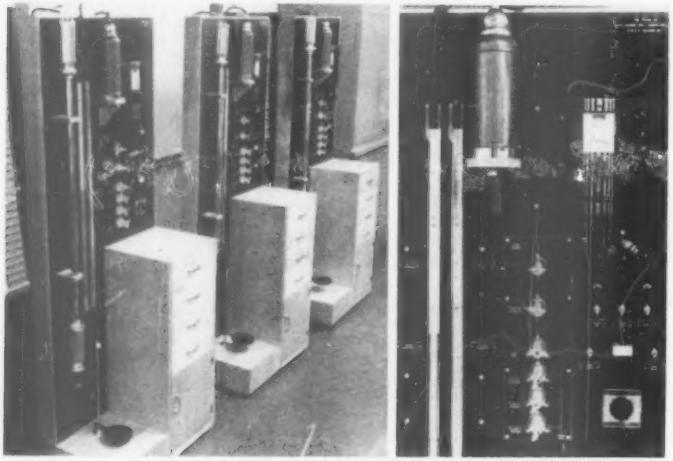


LEFT: In the modernized low-temperature fractional-analysis units each column is mounted on a separate panel 30 in. wide. All controls are within easy reach of the operator. RIGHT: Temperature readings are obtained with panel-mounted Leeds-Northrup potentiometer at upper right. Thermocouple selector switch and other controls are at lower right. Stopcocks are mounted separately, replacing former rigid manifold.

Here is Texaco's version of a . . .

Compact, Manual Low-Temp Fractional Distillation Unit

I. M. Smith, Jr.*

SOME changes made at The Texas Co.'s Signal Hill, Calif., laboratory brought the opportunity to modernize the manually operated low-temperature fractional-distillation apparatus used in natural gas-gasoline operations.

In the modernized units each column has been mounted on a separate panel, 30 in. wide, and is equipped to operate as an independent unit. All of the controls have been located on the front of the panel within easy reach of the operator. There is nothing at the back of the panel that requires attention during column operation.

The units are compact, but wide enough to offer ample freedom of movement. The electrical wiring and copper-tubing systems on the back of the panel have been simplified and are easily accessible for maintenance.

The new units are equipped with Leeds-Northrup panel-mounted potentiometers. The temperature range is from −200° C. to 50° C., and the scale is in divisions of 1°. The indicator is mounted on the panel at eye level for easy observation. Automatic reference junction compensation is incorporated.

Through the use of a rotary-selector switch the operator can read the column, condenser, and receiver temperatures at one place. This instrument also permits the use of an additional thermocouple inside the column to check the temperature of the condensed vapors at the top of the column packing. The knowledge of this temperature is of value when approaching breaks.

Stopcock installation . . . The stopcocks on the new units are mounted separately (instead of rigid manifolding), and the condition of each may be readily observed. Each stopcock is mounted on a clear plastic cylinder. The cylinders are of sufficient length to hold the stopcocks away from the panel. Each cylinder has a flanged lip at the base, and is held firmly in place by this flange inserted between the panel and a 3/16-in.-thick name plate.

The name plate is screwed to the panel. The outer edge of the cylinder is cut to receive the legs of the stopcocks. The stopcocks are held snugly to the cylinders by wires. The legs of the stopcocks protrude through the panel and are connected behind the panel by neoprene tubing to the vacuum and column headers and to the receiver bottles.

With this arrangement, a stopcock may be removed for repair or cleaning simply by cutting the wire ties and the neoprene tubing connections.

Manometer and heating systems . . . Manometers on the new unit are raised and lowered by positive water displacement. Mercury is held in a steel reservoir which is mounted at the back of the panel. The reservoir is mounted in such a position that the mercury in the manometers will drain by gravity. Tygon tubing is used to connect the bottom of each manometer to the bottom of a reservoir.

Water under pressure is admitted to the top of the mercury reservoir when the level of a manometer is to be raised. When the water pressure on the mercury is vented, the level of the manometer will fall by gravity.

The raising and lowering of each manometer is controlled closely by the use of two panel-mounted needle valves. These valves are mounted beside each manometer within easy reach of the operator. The upper valve is used to raise the mercury, and the lower valve drops it. The water is supplied from the 60 lb. city water line. One-quarter-inch copper tubing with flare-joint connections is used throughout the water system behind the panel.

The new electric-heating system employs a Varitran, a panel-mounted variable transformer, and a 6-volt transformer. Voltage to the 6-volt transformer is regulated by the Varitran. An ammeter is used in series in the system to detect the current flow to the heaters. The one control on the Varitran allows linear regulation of the current to the heaters over the entire operating range.

This system has proven satisfactory, especially when a low current is required.

Cooling and receiving systems . . . Introduction of liquid nitrogen as cool-

*The Texas Co. Producing Department, Pacific Coast Division.

ant to the column condenser is now controlled by one conveniently located needle valve on the panel. The liquid-nitrogen bottle is held in a rack on the front of the panel, and located in a position where changing or refilling can be done quickly. Air pressure to the bottle is controlled by the needle valve. Pressure in the liquid-nitrogen bottle is vented through a small hole in the copper tubing between the needle valve and the bottle.

The cooling liquid in the column condenser bath is stirred by air which is admitted through a glass tube to the bottom of the condenser. The air for stirring is controlled by a panel-mounted needle valve.

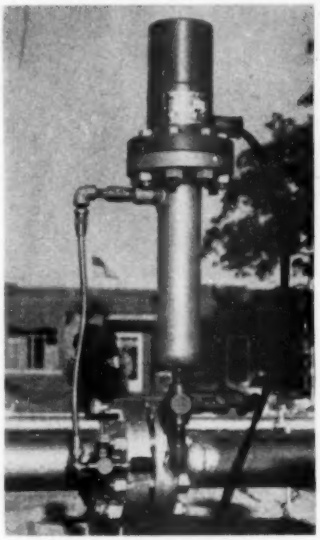
Vapor-receiver bottles are located directly behind the panel in an insulated plywood box. After all connections were made and the bottles had been calibrated, the space around the bottles was filled with a granular insulating material. Except when room-temperature variations are extreme, the bottle temperatures vary less than 1° C. during a lengthy analysis.

Panel system . . . The new panels are made of Formica glued under pressure to a ¾-in. plywood backing. This type of panel material has many advantageous features. It may be had in large sheets that permit one-piece construction. When glued to plywood, it has ample strength to support the instruments and other mounted equipment. It has a hard surface, but it may be drilled, cut, or otherwise worked with ordinary wood-working tools.

The black, satin-finish Formica used requires little work to maintain its neat appearance. There is little reflection from this type of finish.

The Formica panel is secured to the cabinet work with wood screws. The cabinet is fastened to the floor with screws and serves to support the panel. The top of the cabinet serves as a desk for the operator. Drawer space is provided so that tools and accessory equipment for each unit may be stored in the unit. The cabinets are made of birch and are finished with three coats of Du Pont penetrating wood finish. This penetrating varnish protects the hard wood from water and gasoline. The unit, including the receiver-bottle box and vacuum pump, is 30 in. wide, 38 in. deep, and 80 in. tall.

At the present time, these units are not portable, but it would require little work to attach them to a rigid frame for moving from one location to another. All that is required for operation is air, water, and 110 volt a.c.



ELECTRONIC indicator installed on pipe line to monitor dielectric constant of hydrocarbons.

Products "Spotter"

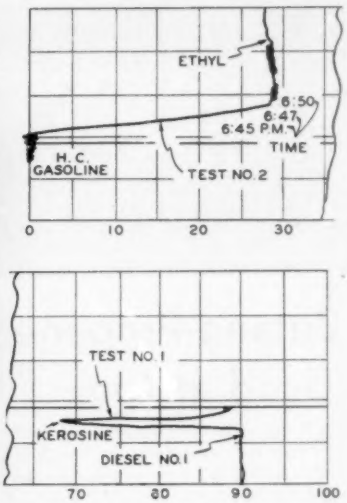
Electronic indicator designed to continuously monitor the dielectric constant of products in pipe lines

A DEVICE known as the "electronic products indicator" has been designed and adapted for continuously monitoring the dielectric constant of hydrocarbon products of a pipe line.

The system consists essentially of a radio-frequency generator of low power and fixed frequency which applies a voltage across a specially designed capacitor cell through which the product flows. This cell permits a small unbalance voltage to be developed which is related to the dielectric factor of the product in the sensing cell.

The design for pipe-line usage gives full-scale movement of graphic recorder for a dielectric change of 5 per cent. This range includes the hydrocarbon products from regular gasolines to and including the heavier fuel oils.

How it works . . . The recorder-indicator unit is connected with the sensing cell by multiconductor cable which may be of any reasonable length, to several hundred feet, at least. The sensing and compensating cell is designed for 1,000 psi. operation, and is attached to the pipe line across an orifice plate or other arrangement to produce a small flow through the cell.

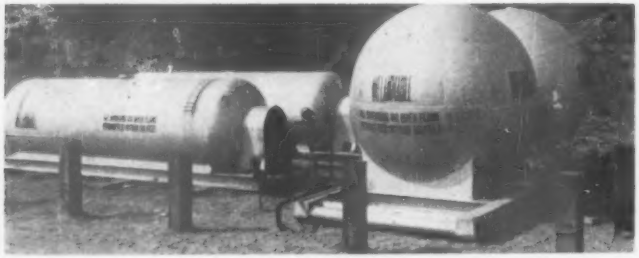


TESTS made at Sinclair's Arlington Station showed deflection of kerosine on reaching sensing-cell position, within 90 seconds.

Tests made . . . Two tests of the instrument were undertaken at the Arlington Station of Sinclair Pipe Line Co. In the first test, a sensing cell was placed on line to the Fort Worth terminal, pumping No. 1 diesel fuel at 1,000 psi. At the manifold-to-intake of pump the diesel-fuel valve was closed, and the kerosine valve opened for 3 minutes. In approximately 90 seconds, the kerosine reached the sensing-cell position and gave full deflection, as shown in the accompanying diagram.

In the second test, a sensing cell was placed on the incoming line from Houston, pumping regular gasoline at 50 psi. A tender of ethyl gasoline followed the regular gasoline. The interface was 20 minutes in length. The instrument indicated that switching should take place at 6:50 p.m. (noted on the chart). This was verified by gravitometer and gravity tests which lagged considerably behind the electronic-products indicator.

The electronic-products indicator is manufactured by Nelson Electric Manufacturing Co., Tulsa, Okla.



FOUR FUEL TANKS have combined capacity of 6,350 gal. of butane and propane.

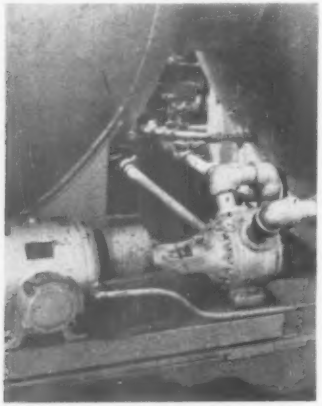
Butane-Propane Used at Rig

AT one of its medium-depth rigs used for both exploratory and development drilling in Cuyama Valley, Calif., and nearby areas, Richfield Oil Corp. has provided these propane and butane tanks for supplying fuel while the rig is drilling in isolated locations. When drilling where natural gas is available the dual-fuel engines operate on gas.

Each of two skid-mounted tanks have a capacity for storing 2,350 gal. of propane. Two spheres on another skid each will hold 2,000 gal. of butane.

Pumping units . . . So that the fuels can readily be unloaded from tank trucks into the rig tanks, a small pumping unit is mounted on the skid of the butane tanks (see bottom photo). The unit consists of a 5-hp. motor driving a 250 psi. working-pressure pump.

Manifolding is provided so that the pump can discharge into either tank.



PUMPING UNIT is mounted on skid of butane tanks. Pump can discharge into either tank.

Seismograph Crews Get to Job Site by Riding Horses

Up in the Jackson Hole basin of Wyoming, ingenious Cities Service Oil Co. seismograph crews are equipped with horses instead of modern mechanized vehicles.

These men, in the Grand Tetons country to find oil traps, follow wild-animal trails in their search for structures favorable for the accumulation of petroleum.

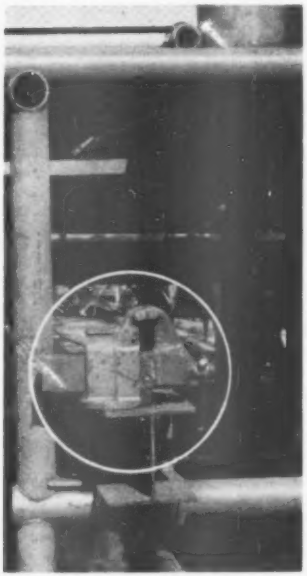
Wild, rugged mountain country hinders the crews, but with portable instruments, patience—and the horses, subsurface traps and structures are being tracked down.

Jackson Hole basin lies west of Wind River basin. Oil production some day may be developed northeast of the Gros Ventre uplift where Paleozoic strata are about 15,000 ft. thick, and are folded into well-developed anticlines.

Gentle folding during the Triassic, Jurassic, and Lower Cretaceous periods likely developed pre-Laramide structural and facies oil traps, and oil and gas may have accumulated in shallow Tertiary facies or structural traps in the basin.

Generator for Engines

Instead of using gas-engine starters, or batteries without generators, Phillips Pipe Line Co. uses a generator and starter on its mobile-type engines in use on its pipe-line-gathering system in Oklahoma County, Oklahoma. The generator keeps the batteries charged, as on an automobile.



Handy Spot for Vise

The vise used in connection with work around a drilling rig is usually in the rig tool box when needed. To save setting it up when wanting to use it, G. A. Duffy of Abilene, Tex., installed the vise on his rig superstructure (see circle). This simple idea saves many minutes of time, and makes work easier.

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THE JOURNAL'S WEEKLY
Engineering Reference
SECTION

No. 20

Fans and Blowers

Part 1—Definitions and Applications

by M. Van Winkle*

Fans and blowers are used extensively in certain phases of processing operations, yet the average process engineer may have difficulty in specifying a fan or blower for a particular application. This results mainly from unfamiliarity with the characteristics of the various types of available fans and blowers and the terminology and calculation methods used in the fan and blower engineering field.

While it is advisable in the final selection of this type of equipment to rely upon the experience of the manufacturers, the engineer should have at least a general knowledge of fans and blowers and their characteristics so that he may be able to select suitable type of equipment.

FANS and blowers are mechanical devices designed to move gases and vapors from one location to another by imparting pressure and/or velocity energy to the fluid in order to overcome friction and resistance to movement. In general they are used where it is necessary to move large volumes of gases or vapors at atmospheric pressure and at pressures ranging from atmospheric to a few inches of water above atmospheric pressure. Although there is no definite line of demarcation between fans, blowers, and compressors, it is usually considered that a blower becomes a compressor when it delivers at pressures from 30 in. of water and higher.

Definitions . . . Because the design, manufacture, and specification of fans and blowers falls within a highly specialized engineering field, a number of special definitions and terms have been set up by the group working in that particular field. The definitions given in the following paragraphs are those standardized by the National Association of Fan Manufacturers.

*Professor of Chemical Engineering, University of Texas.

Standard air density is equal to 0.075 lb. per cu. ft. This is for dry air at 70° F. and 29.92 in. of mercury pressure.

Standard flue gas density is equal to 0.078 lb. per cu. ft. This is the density of an average flue gas at 70° F. and 29.92 in. of mercury pressure.

Volume delivery is the volume in cubic feet of air per minute delivered at the outlet condition of the fan; that is, at the pressure and temperature at the outlet.

Fan total pressure is the difference in pressure from the fan inlet to the fan outlet and corresponds to the manometer reading shown in Fig. 1 (a).

Fan velocity pressure is the pressure corresponding to the velocity of the volume of air flow at the fan outlet area. This corresponds to the manometer reading shown in Fig. 1 (b).

Fan static pressure is the total pressure minus the velocity pressure of the fan. This corresponds to the manometer reading shown in Fig. 1 (c).

Power output of the fan is the horsepower delivered across the fan. This is calculated as follows:

$$W_o = \frac{V_o P_r}{33{,}000}$$

$$= \frac{(\text{ft.}^3/\text{min.})\ (\text{lb./ft.}^2)}{(33{,}000\ \text{ft.-lb.})/(\text{Hp.})\ (\text{min.})}$$

Power input is the measured horsepower delivered to the fan shaft.

The **mechanical efficiency** is equal to the ratio of power output to the power input times 100.

Static efficiency is equal to the mechanical efficiency times the ratio of static pressure to total pressure.

Fan outlet area is the inside area of the fan outlet flange.

Fan inlet area is the inside area of the inlet collar.

TABLE 1—FAN AND BLOWER APPLICATIONS

Where used—	Gas or vapor
Forced-draft cooling towers	Air
Air-conditioning equipment	Air
Room and building exhaust systems	Air, hydrocarbon vapors, fumes, etc.
Absorber gas feed systems	Hydrocarbon vapors, SO_3, H_2S, etc.
Forced-draft furnaces: oil, boiler, H_2SO_4 concentrators	Air
Catalysts and clay regenerators	Air and flue gas
Pneumatic lifts: catalysts, clays	Flue gas, air

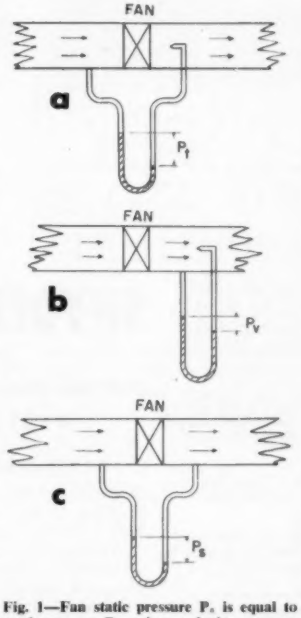
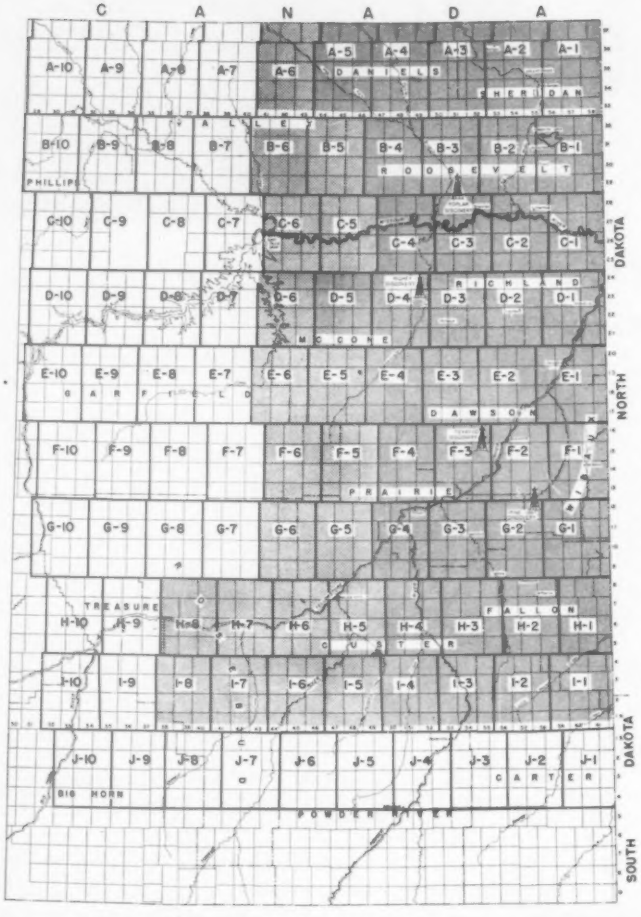


Fig. 1—Fan static pressure P_s is equal to total pressure P_t, minus velocity pressure P_v of the fan.

EASTERN MONTANA OWNERSHIP MAPS


C A N A D A
A-10 A-9 A-8 A-7 A-6 A-5 A-4 A-3 A-2 A-1
DANIELS
SHERIDAN
B-10 B-9 B-8 B-7 B-6 B-5 B-4 B-3 B-2 B-1
ROOSEVELT
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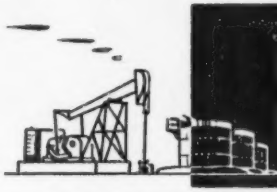


Critical Flow of Gas in Pipe

by Ralph F. Nielsen*

WHEN a gas travels at a very high velocity in a pipe, such as in the case of open flow of a high-pressure gas well, the usual pipe-line formulas do not hold. If, for instance, we apply one of the usual pipe-line formulas to a short length of pipe, assuming a high pressure difference over the length, we may arrive at a value for the flow rate corresponding to a linear velocity greater than the velocity of sound in the gas. The velocity relative to the upstream reservoir, however, cannot exceed the acoustic velocity within the pipe, since the pressure gradient cannot then be transmitted so as to be used in overcoming frictional work.

In a previous installment of this series (Engineering Fundamentals No. 487) the phenomenon of "critical flow" through an orifice or nozzle was discussed. The velocity in the throat or vena contracta relative to the reservoir feeding the nozzle cannot exceed the velocity of sound, and when the velocity is reached in the throat critical flow prevails. Such flow conditions are the basis of the theory of the choke nipple and critical-flow prover for gas-flow measurements.

In the case of a nozzle the pressure drop is used to accelerate the gas. Thus in the mathematical theory the friction term of Bernoulli's theorem was dropped and the acceleration work term retained. In applying Bernoulli's theorem to flow in a pipe it has been assumed that the frictional work was much larger than the acceleration work. If a length of pipe is fed from a gas reservoir at pressure P_0 and feeds to a reservoir or the atmosphere at a much lower pressure P_3, both kinds of work must be considered. Acceleration work is done in starting the gas into the pipe, causing a pressure drop $P_0 - P_1$ where P_1 is the pressure in the pipe near the upstream end. Frictional work is done through the length of pipe, causing a pressure drop $P_1 - P_2$ where P_2 is the pressure in the pipe near the downstream end. If the flow is critical the velocity near the downstream end (at P_2) is the acoustic velocity. P_2 and P_1 are determined as the necessary pressure drops from P_0 to provide the frictional and acceleration work for these flow conditions.

The velocity of sound in a gas in feet per second is given by:

$$v_c = (gkPV)^{1/2} \qquad (1)$$

where k is the specific heat ratio, P is the pressure in pounds per square foot and V the specific volume. Since $V = 1{,}544\ T/29\ GP$:

$$v_c = 41\ (kT/G)^{1/2} \qquad (2)$$

In terms of the daily rate Q through a pipe of diameter d inches:

$$v = \frac{QT \times 14.7 \times 4 \times 144^2}{P \times 86{,}400 \times 520 \times d^2} = 0.009\ QT/Pd^2 \qquad (3)$$

which at critical conditions must equal v_c. Whence:

$$Q_c = 4{,}600\ Pd^2\ (k/GT)^{1/2} = 6.6 \times 10^5 \times pd^2\ (k/GT)^{1/2} \qquad (4)$$

In this case $P = P_2 = 144p_2$. If it be assumed that the frictional pressure drop is given roughly by Weymouth's formula for isothermal conditions we can write:

$$Q = 15{,}300 \left[\frac{(p_1^2 - p_2^2)d^{16/3}}{GTL} \right]^{1/2} = 6.6 \times 10^5\ pd^2\ (k/GT)^{1/2} \qquad (5)$$

from which:

$$p_1/p_2\ (crit) = \left(1 + \frac{0.35\ k\ l}{d^{4/3}} \right)^{1/2} \qquad (6)$$

where l is the distance in feet from p_1 to p_2.

Thus, according to the equations, if the pressure p_1 near the upstream end is greater than p_3 (the pressure to which the pipe discharges) multiplied by the radical of Equation 6, the flow is critical. In that case the pressure near the downstream end, p_2, is found from p_3 by Equation 6 and the flow from Equation 4. If the flow is not critical $p_2 = p_3$ and the pipe-line formulas apply using p_1 and p_2.

If the pipe is discharging from a reservoir at pressure p_0, the relation of p_0 to p_1 is estimated from Bernoulli's theorem without the friction term:

$$gV\ dP = v\ dv \qquad (7)$$

by integrating between P_0 and P_1 and 0 and v_1, after substituting for V by the gas laws and assuming isothermal expansion. Then:

$$v_1 = 41\ [(2T/G)\ \ln\ (p_0/p_1)]^{1/2} \qquad (8)$$

Substituting for v_c and p_2/p_1 from Equations 2 and 6:

$$\ln\ (p_0/p_1) = \frac{k}{2\ [1 + (0.35\ l\ k)/d^{4/3}]} \qquad (9)$$

whence p_1 is calculated from p_0 by Equation 9, then p_2 from p_1 by Equation 6 and Q by Equation 4. If the value of p_2 thus calculated is less than p_3 the flow is not critical.

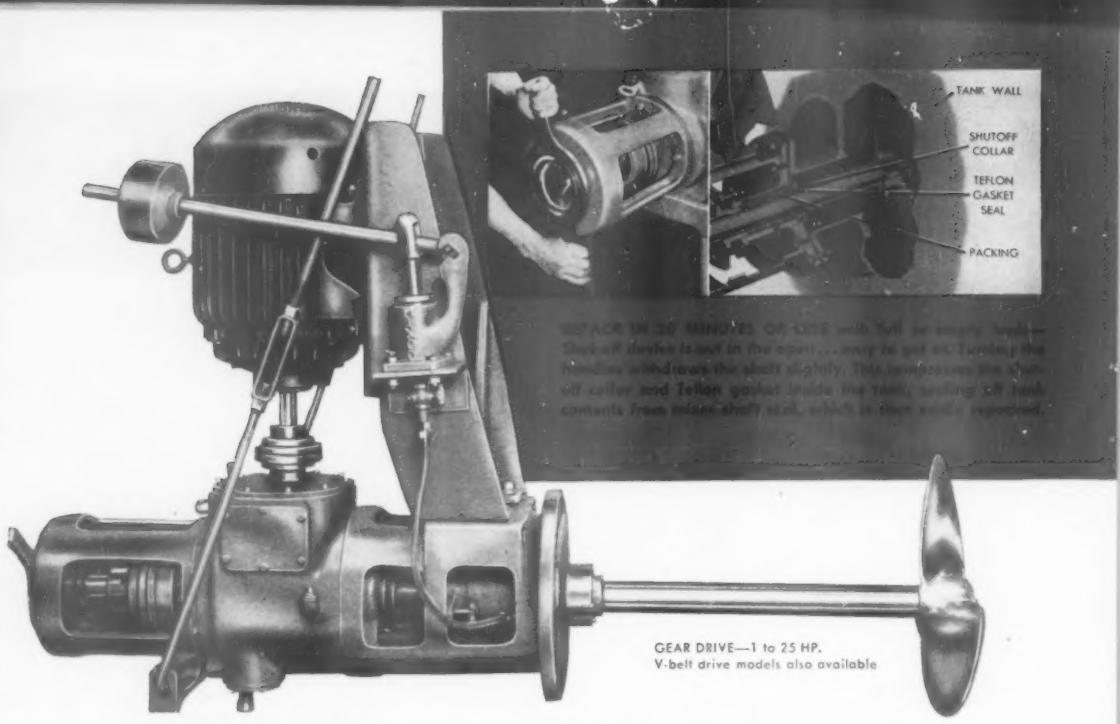
For noncritical flow from a reservoir at p_0, $p_2 = p_3$, and the flow is found by combining a suitable pipe-line formula with an expression for the pressure loss due to accelerating the gas into the line. With present assumptions p_1 may be obtained by setting the first part of Equation 5 equal to $144\ p_1\ d^2\ v_1/0.009\ T$, v_1 in turn being given by Equation 8. A graphical or trial-and-error solution for p_1 could then be made.

The above equations are of course subject to the approximations and assumptions made. In particular the friction factor is a matter of doubt. The treatment, however, shows the general analytical basis for analysis of the problem.

*Associate professor, petroleum and natural-gas engineering, Pennsylvania State College.

Reference

1. Brown et al, Unit Operations, Chap. 15, John Wylie & Sons, 1950.



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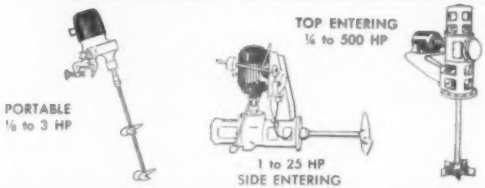

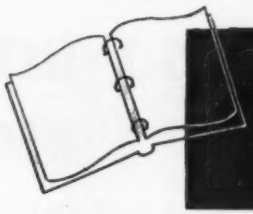

BUTTERFLY VALVES: Capacities

by C. A. Dally*

IT is normal practice to size the valve so that, if possible, the minimum flow at which control is required will be passed when the valve is at least 15° open. The maximum recommended turndown for a butterfly valve is approximately 10 to 1. To get good control beyond this range, a bypass valve should be used; or as is often done with larger valves, a smaller port is built into the larger disk. With this latter arrangement separate operating devices are employed for each disk. To avoid operating near the closed position when it is desirable to install a line-size butterfly valve, it may be designed with a reduced port as is frequently done with other types of control valves.

Butterfly control valves are usually not operated beyond a maximum opening of 60°, and the curve in Fig. 1, Installment No. 135, (August 25) was said to be based on this maximum opening. The reason behind this restriction lies in the design of the valve itself. A butterfly valve is basically designed around its main shaft—the shaft diameter being determined by the operating torque requirements and the maximum thrust load on the disk which it supports. The minimum thickness of the disk through its center is then established by the diameter of the shaft passing through it and the metal section required to support the load on the disk.

Since the disk thickness determines the maximum open area available in the valve, the restriction it produces will increase in proportion to the pressure drops for which the valve is designed. As the valve is opened, the wings of the disk begin to disappear into the profile of its center section. Consequently, at some angle less than 90° open a limit of the variable area of the valve is reached, and no increase in open area will be obtained by further rotation of the disk.

Fig. 1, this installment, illustrates by means of the regular shaded area the variable area available at 60° and 70° openings in a valve with a 15 per cent restricted area. The minimum disk thickness is indicated by the dark irregular shading in the center of the projection. While opening the valve beyond 70° would result in some increase in open area, the amount of increase obtained by a given valve movement would be rapidly decreasing. If the valve is designed for high pressure drops—for example, with a fixed restriction of 40 per cent of the pipe area—the variable area available is reduced to that shown in Fig. 2. At 60° opening the variable area remaining would be sufficient to give good control; but as the 70° position is approached, the disk projection reveals practically no variable area remaining. Hence, further rotation of the disk would only reduce the turbulence produced by the disk.

Since the approach velocity of the fluid is not lost in a butterfly valve, the capacity of this type valve when 60° open is found to be greater than that of the same nominal size plug type valve at full lift for most sizes. If a butterfly valve is opened beyond 60°, its capacity will continue to increase until at 90° opening the pressure loss in the valve is reduced to a minimum. This loss, which is a function of valve design and Reynolds' number, will normally equal approximately 20 per cent of the velocity head of the fluid in the pipe.

Thus the butterfly valve is ideally suited for the process requiring a control valve which at certain times may be opened to produce a minimum possible pressure loss in the system. It is an established fact that the quality of control obtained from a valve is quite dependent upon the ratio of the pressure drop across the valve to that of the entire system. This factor decidedly must be considered when using a butterfly control valve just as it is when using other types of control valves.

The same installation and service factors, such as pipe fittings adjacent to the valve, etc., that were said to affect the torque characteristics of a butterfly valve will also affect its flow and capacity characteristics. The theoretical characteristics will only be realized if the flow approaching the valve is equalized and straightened and the valve discharges into a straight section of pipe several diameters long. At flow conditions producing cavitation in liquids, or at flow rates equal to sonic velocity in gases, the capacity of a butterfly valve is reduced from that calculated by the standard coefficients or indicated by sizing rules or flow charts. Correction factors should be applied when sizing valves for these conditions.

*Continental Equipment Co., Coraopolis, Pa. From paper presented at seventh annual process instrumentation symposium at Texas A. & M. College, 1952.

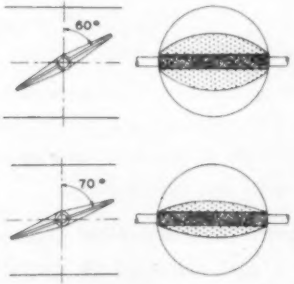

Fig. 1—Variable vs. dead area, normal design, 15 per cent restriction.

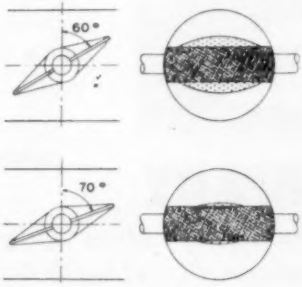

Fig. 2—Variable vs. dead area, heavy design, 40 per cent restriction.

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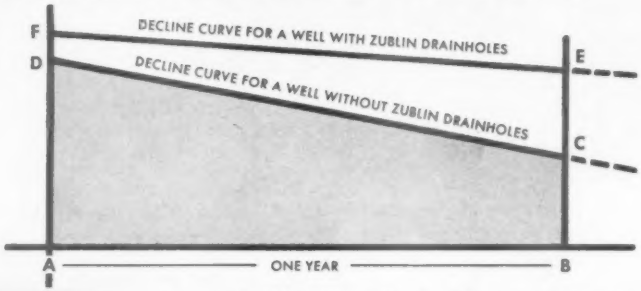

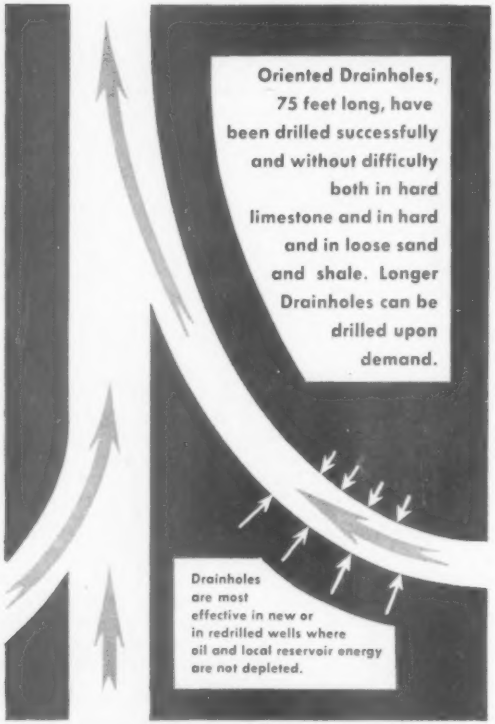
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How to Maintain Oil-Field Chains—3

by Dave Breith*

Input drive chains . . . Nearly all power rigs have oil-bath chain cases on the master input drive chain, but in the rare case where this is not so, an oil-bath chain case should be built and installed; drip oiling is not sufficient to take care of the chain speeds generally found in these drives.

The majority of steam-powered rigs have been equipped by their owners with such a case, but if not, a generous quantity of oil should be provided in this drive, and, as before mentioned, properly directed into the chain.

Multiple-engine drives, where chain is used to compound between the engines, and to provide a power takeoff for either single or double slush-pump drives, almost without exception are equipped with oil-bath cases, or are equipped with pump-spray lubrication. The same precautions should be taken on these drives as previously outlined for drives within the draw works. Remember: These checks should be frequent, regular, and careful; they are as important to operating overhead as the grease-up precaution.

Rotary table chains . . . The very nature of the action of the rotary table tends to twist the table out of alignment. The torque developed in turning the drill pipe through the kelly joint (or grief stem), puts a considerable pressure against the choking, blocking, or bolts holding the rotary table over the center of the hole.

If that torque from the effort of "turning toward Tulsa" were all that is involved, the problem would be a simple one. Far from it. As the hole gets started and the various geological strata are encountered, some drill smoothly, some bounce, jerk, buck, and kick.

As the pipe kicks, jerks, and bounces, the table receives the same treatment, but it is an action from side to side instead of the up-and-down travel of the pipe. The chain is receiving snaps and jerks, overloads, and racing action.

What to do about it: 1. Make periodic checks to realign the sprockets on the drive.

2. At the same time, look for and replace all missing chain cotters.

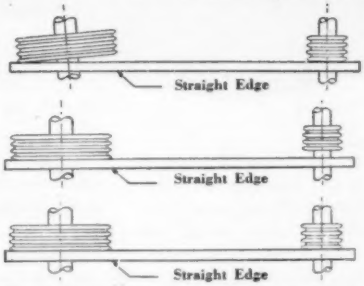
3. Look for cracked rollers and burred or peened sidebars which may have been caused by banging against the sides of the sprockets, the chain guard or case; or if the chain is too slack, from slapping together in middle of the drive span.

4. Maintain proper slack, but not an excessive amount; about one and one-half pitch lengths of up-and-down movement on the slack or loose side of the chain drive, is recommended. A chain that is running without slack, one that is too tight for the drive, will wear itself out, even with fair lubrication, and with light or no loads.

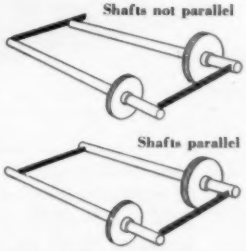
5. When checking alignment use a straightedge. Do not depend upon eyesight alone.

The rotary countershaft drive, the drive to the cat shaft, the low-speed drive to the drum shaft, and the high-speed drive to the drum shaft, should get regular, though less frequent, checks for missing cotters, scarred or cracked rollers, and side plates. Before rigging up on a new location, alignment of the sprockets should be checked with a straightedge.

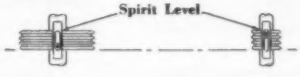
Shaft and Sprocket Alignment



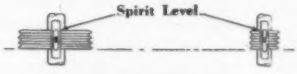
Correct alignment shown in bottom sketch. Upper two incorrect.



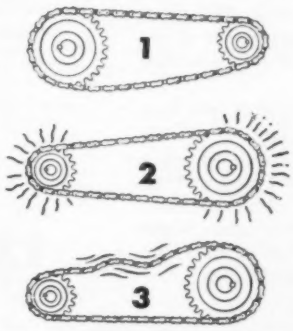
Shafts should be aligned for parallelism using feeler bar. Bottom sketch is correct.



Poor shaft alignment



Correct shaft alignment



Tension in chains should be adjusted correctly. (1) is correct. Chain is too tight in (2) and too loose in (3).

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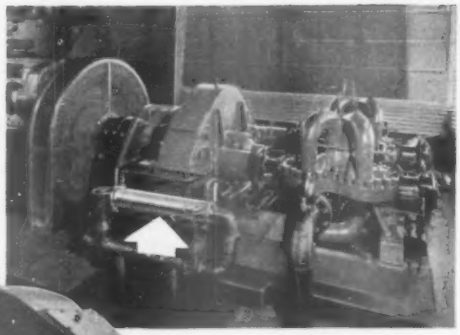
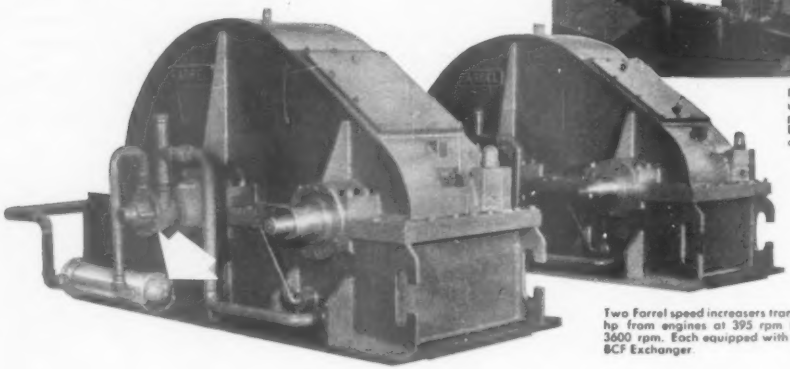


Farrel two-pinion speed increasing unit delivering 300 hp each to two pumps from a single 600 hp engine. Equipped with Ross Type BCF Exchanger.



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QUESTIONS ON TECHNOLOGY

by W. L. Nelson
Technical Editor

Correlation of Hempel and True Boiling Point Crude Distillation Curves

"How can we convert Hempel distillations of crude oil into true-boiling-point distillation?"—F.M.C.

Data are not extensive or altogether satisfactory but the correlation shown in Fig. 1 is based upon 53 sets of distillations, of which 6 had to be discarded because they were obviously incorrect. The correlation accuracy is very good (less than 1°F. error) but the average error of the points is 4.9° F. Eighteen per cent of the points (a total of 217) were in error by more than 20° F. and one point was in error by 52° F. The great variations that occur in Hempel distillations (even more than with A.S.T.M., 10 per cent, or Saybolt distillations) cannot be satisfactorily explained but such inconsistencies have been found repeatedly during the last 25 years. Extrapolations of Hempel curves past 700° F., even if they have been conducted at reduced pressure, are doubtful because cracking is usually occurring.

Although the purely empirical correlation of Fig. 1 most faithfully represents all available data, it is felt that the cross-plotted values of Table 1 are probably basically more accurate.

To determine the T.B.P. curve from a Hempel curve, it is first necessary to estimate the T.B.P. 50 per cent boiling point. This estimate may in extreme instances need to be corrected by trial and error. Corrections read from Table 1 are then subtracted from the Hempel temperatures (at 200°, 300°, . . . 700° F.) arriving at T.B.P. temperatures which are then plotted at the same percentages.

The distillation loss should be included in the Hempel curve when applying the method described herein.

TABLE 1.—RELATIONSHIP OF T.B.P. AND HEMPEL DISTILLATION TEMPERATURES

(Data of Fig. 1 smoothed by cross-plotting).

Hempel Temp. °F.	200	300	400	500	600	700*
T.B.P.†	Subtract these numbers of degrees from the Hempel Temp.					
300		39	37	35	39	41
400		18	17	15	12	10	15
500		10	9	8	5	4	4
600		10	9.5	9	5.5	3.5	2.5
700		14	13	11	7	4.5	3
800			19	14	9	6	3.5
900				17	12	7.5	4.5
1000					15	9.5	5.5
1100							7.0

*Probably too low due to cracking.
†Mid Boiling Point.

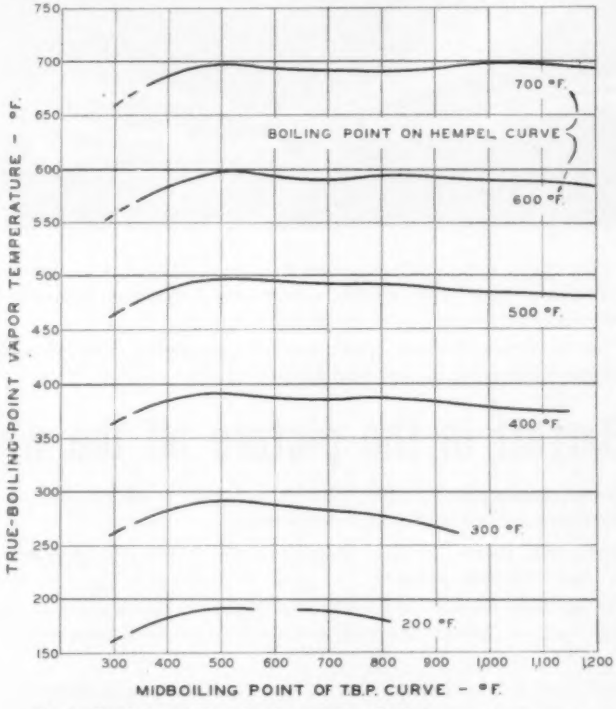


Fig. 1—Correlation of Hempel and true-boiling distillation-curve temperatures.

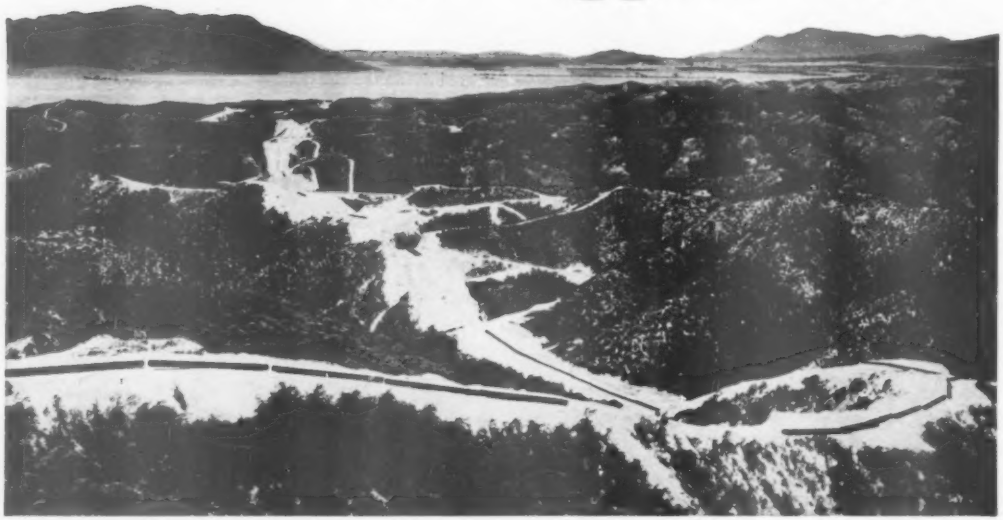
The Word "Petrochemical"

"Do you know when and where the term 'petrochemical' or 'petrochemistry' came into use? Was there any use of these terms prior to their use by The Oil and Gas Journal (January 25, 1942)? Do you know when and by whom these terms were coined?" C. S.

The Oil and Gas Journal published a section on petroleum chemistry in its June 25 issue of 1942 in which the word petrochemical was introduced. (The date of January 25, 1942, which is sometimes mentioned is not correct.) The use of the term caused no great discussion among Journal editors because the usefulness of such a concise and descriptive term was (and is) obvious. It probably arose during discussion in which no one could claim authorship. No earlier usage of the term is known to the author and it probably appeared first in his column on May 13, 1943, in the title "Possibilities of the Petrochemical Industry Are Now Developing."

The usefulness of the word is evident in the widespread use of it today, and it may be of interest to note that editors of Chemical Engineering are now using the prefix "Petro" in distinguishing between the sources of hydrocarbons as "Boost for Petrobenzene" (June 1952, p. 262).

Barrett*
Coal-Tar Enamels protect the "Biggest Inch"



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Part 3 of a series

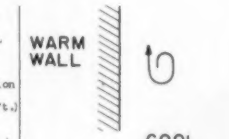
by Dr. B. E. Lauer, Head, Department of Chemical Engineering, University of Colorado

h_f HEAT TRANSFER

COEFFICIENT of HEAT TRANSFER through FILM between SURFACE of WARM VERTICAL WALL and COOL GAS

Gas Movement: Natural Convection

Length of Wall: Long (over 2 ft.)



EQUATION:

$$h_f = 0.13 \frac{K}{L}\left[\frac{L^3\rho^2\beta g\Delta t}{\mu^2}\cdot\frac{C_p\mu}{K}\right]^{\frac{1}{3}}$$

or simplified

$$h_f = 0.13\left[\frac{K^3\rho^2\beta C_p g\Delta t}{\mu}\right]^{\frac{1}{3}}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of gas at t_f, BTU/hr. ft.^{2} °F./ft.

L - Height of vertical wall, ft.

ρ - Density of gas at t_f, lb./cu. ft.

g - Acceleration of gravity. 4.17×10^8 ft./hr.^{2}

β - Coefficient of volumetric expansion of gas at t_f. (cu. ft./cu. ft.)/°F.

Δt - Temperature difference between wall and gas, °F.

μ - Viscosity of the gas at t_f, lb./ft. hr.

C - Specific heat of gas at constant pressure, BTU/lb.°F.

t_f - Film temperature, °F. Assume to be arithmetic average age of wall temperature and bulk gas temperature.

LIMITATIONS: Equation is applicable for values of the function,

$$\left[\frac{L^3\rho^2\beta g\Delta t}{\mu^2}\cdot\frac{C_p\mu}{K}\right]$$ above 10^9.

Virtually every case involving walls over 2 ft. in height will exceed this value.

SPECIAL CASE: Air at room temperature and one atmosphere:

$$h_f = 0.27\ (\Delta t)^{0.25}$$

SOURCES OF DATA: For physical constants for use in above equation see Chemical Engineers' Handbook - J. H. Perry (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1190, 1696.
β -- see pp. 200-202.
K -- see pp. 459-461, 1303, 1697.
C -- see pp. 228-235, 297, 1588, 1696.

REFERENCES:

1. Introduction to Heat Transfer, Brown and Marco, pp. 113-115.

2. Chemical Engineers' Handbook, Third Edition, J. H. Perry, p. 474.

COEFFICIENT of HEAT TRANSFER through FILM between SURFACE of WARM VERTICAL WALL and COOL GAS

Gas Movement: Streamline (viscous)

EQUATION:

$$h_f = 0.662 \frac{K}{L}\left[\frac{C\mu}{K}\right]^{\frac{1}{3}}\left[\frac{LV\rho}{\mu}\right]^{\frac{1}{2}}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr. sq. ft. °F.

K - Thermal conductivity of gas, BTU/hr. ft.^{2} °F./ft.

L - Height of vertical wall, ft.

C - Specific heat of gas at constant pressure, BTU/lb. °F.

μ - Viscosity of the gas, lb./ft. hr.

V - Velocity in ft./hr.

ρ - Density of gas, lb./cu. ft.

LIMITATIONS:

Extreme caution must be used in the application of this equation in that gases rarely can be caused to flow in laminar flow while being heated or cooled.

SPECIAL CASE:

For air at velocities of less than 15 ft. per sec. the following formula can be used.

$$h_f = 0.8 + V/322$$

SOURCES OF DATA:

For physical constants for use in above equation see Chemical Engineers' Handbook, J. H. Perry (1948).

for ρ -- see pp. 130-148, 175-195, 1583
μ -- see pp. 370-374, 1190, 1696.
K -- see pp. 459-461, 1303, 1697.
C_p -- see pp. 228-235, 297, 1588, 1696.

REFERENCES:

1. Introduction to the Transfer of Heat and Mass, Eckert, pp. 89-93.

COEFFICIENT of HEAT TRANSFER through FILM between SURFACE of WARM VERTICAL WALL and COOL GAS

Gas Movement: Turbulent Flow

EQUATION:

$$h_f = 0.055 \frac{K}{L}\left[\frac{LV\rho}{\mu}\right]^{0.75}$$

TERMINOLOGY:

h_f - Film coefficient of heat transfer, BTU/hr.sq.ft.°F.

K - Thermal conductivity of gas, BTU/hr. ft.^{2} °F./ft.

L - Height of vertical wall, ft.

V - Velocity in ft./hr.

ρ - Density of gas, lb./cu. ft.

μ - Viscosity of the gas, lb./ft. hr.

LIMITATIONS:

Experimental work only on short surfaces.

For lengths greater than 2 ft. use the value $L = 2$.

SPECIAL CASE:

For flow of atmospheric air at velocities greater than 15 ft./sec. the following formula can be used.

$$h_f = V^{0.75}/830L^{0.25}$$

Use the value $L = 2$ for any length greater than 2 feet.

SOURCES OF DATA:

For physical constants for use in above equation see J. H. Perry's Chemical Engineers' Handbook, (1948).

for ρ -- see pp. 130-148, 175-195, 1583.
μ -- see pp. 370-374, 1190, 1696.
K -- see pp. 459-461, 1303, 1697.

REFERENCES:

1. Introduction to Heat Transfer, Brown and Marco, p. 106-107.

2. Introduction to the Transfer of Heat and Mass, Eckert, p. 117-120.

The fittings that revolutionized pipe welding . . .

In the year 1931 Taylor Forge gave industry its *first real line* of seamless, butt-welding pipe fittings. We say it was the first *real* line because it was the first to include not only long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, caps and welding neck flanges.

This was a fully planned development. Many years before Taylor Forge had foreseen the future of the butt-welding fitting . . . had realized that pipe welding could not go beyond its then crude stage until pipe users were given *all* the fittings necessary to make up complete piping systems.

So Taylor Forge went to work on this and after long research and development came out with the full line that became the inspiration of modern pipe welding.

Naturally the organization that started ahead has kept ahead . . . in design, in quality, in breadth of line. That is why so many men who have followed the development of the WeldELL line, refuse to consider any other kind of welding fittings.

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OIL AND GAS EQUIPMENT Digest

IT'S NEW — CHECK IT

TRADE LITERATURE

1 PITTSBURGH PAINTS FOR THE PETROLEUM INDUSTRY is a handy desk-size paint manual which contains complete descriptions of all Pittsburgh paints for petroleum industry. Manual discusses product description, suggestions for proper application and maintenance, large-size color chips, inspection, and surface preparation and painting of storage tanks. *Pittsburgh Plate Glass Co.*

2 HAS EVERYTHING, DOES EVERYTHING. A pocket-size multicolored folder contains photographs, descriptive and engineering data on three models of crawler-type tractors and available accessories. Folder also includes industrial applications. *American Tractor Corp.*

3 PUMP VALVE SERVICE, a seven-page brochure, illustrates and describes metal valves furnished ready to install in any type of reciprocating pump, air and gas compressors, and gas engine, designed to operate in water, oils, acids, alkalies, air and gases at all temperature-pressure combinations. Cutaway views and dimension charts are included. *Durabla Manufacturing Co.*

4 GARLOCK MOLDED CUPS, a six-page bulletin, contains illustrations of various types of molded cups, service data, and a complete list of sizes and part numbers. Typical applications are also shown. *The Garlock Packing Co.*

5 BOWEN TOOLS CATALOG. New 52-page illustrated catalog covers complete line of Bowen and Bowen-ITCO tools, their uses, operation, care, and maintenance. *The Bowen Co.*

6 BELTRACTION LIQUID BELT TREATMENT. Data sheet describes treatment used for all types of V-belts and flat belts, and effective also on ropes and cables. It is packed in convenient quart cans with handy applicator spout easily applied directly from can to belts. A price list is included. *Beltraction Co.*

7 HYDRAIR 35 SERIES RIG. Bulletin 35-52 describes new torque-converter drilling rig, designed for 350 input horsepower, available in single and dual-engine arrangements. It describes special model Hydrair 35 DD equipped with extra-large sand-line drum which increases its servicing rating to a depth of 16,400 ft. New Hydrair 35 rig features a torque converter, drive, finger-tip air controls, and air clutches. *Ideco Division, Dresser Equipment Co.*

8 SCHIELD BANTAM TRUCK-MOUNTED BACK HOE, new illustrated folder, includes detailed engineering information on mechanical features, with a large, easily read chart showing dimensions and operating data. Folder also includes specification of interchangeable 2½-ton crane adaptor and two types of backfill blades which permit complete handling of pipe unloading, trenching, placement, and

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backfill with one machine and operator. *Schield Bantam Co.*

9 **PRODUCTS AND PROCESSES FOR INDUSTRY** is an especially prepared catalog for men of industry who are charged with responsibility of investigating and selecting products for chemical handling and processing. It presents case histories of typical process applications together with brief descriptions of the equipment. *Infilco, Inc.*

10 **PROCESS PUMPS** is a profusely illustrated 12-page brochure which discusses development of Class SFLA pumps for handling light refinery liquids at temperatures to 250° F. These compact space-saving pumps are built in 1, 1½, 2, 3, and 4-in. sizes for capacities to 1,000 g.p.m and pressures to 600 psi. *Ingersoll-Rand Co.*

11 **ENGINEERING CATALOG NO. 51,** in a 9 by 11-in. binder, describes full line of all-metal flexible couplings for power transmission. Couplings are grouped and indexed to facilitate quick reference. Keyway data, standards for straight and tapered bores as well as ordering instructions are included for each group. Special section shows couplings designed for specific purposes with photos of typical installations. *Thomas Flexible Coupling Co.*

12 **MAINTENANCE MANUAL.** Bulletin 500 describes disconnecting hydraulic couplings, and presents diagrams of Model HUD, explaining fluid dumping feature which disconnects output shaft from source of power. Cooling circuits are illustrated. Bulletin also contains horsepower range chart for HUD selection. *Twin Disc Clutch Co.*

13 **HARD-FACING MANUAL NO. 77** covers various hard-facing alloys, and explains and illustrates characteristics of Colmonoy alloys, sprayweld process, castings, Nicrobraz, stainless brazing alloy, typical industrial applications, and finishing data. *Wall Colmonoy Corp.*

14 **FABRICATED FITTINGS.** Bulletin No. 525 is a practical help in planning piping and equipment layouts. Data include specifications and prints on standard fittings for lightweight pipe. It also presents illustrations of special fabrications designed to save time and labor, and reduce material costs in modernizing piping systems. *Naylor Pipe Co.*

15 **RADIAL AIR COMPRESSORS.** Two-stage, air-cooled radial air compressors capable of producing 80 to 125 psi. pressure are described in 12-page bulletin. Dimensions and weights of bare, base-mounted multi-V-belt driven, base-mounted flexible-coupled, and unabloc (close-coupled) compressors are given, together with capacities, sizes, general specifications, and cross-section photographs. *Worthington Corp.*

16 **AUTOCON BUBBLTROL,** an eight-page pamphlet, discusses bubbler-type pressure-operated liquid-level control which operates from level variations of inches. Especially suited for sewage and industrial processing applications, it operates by passing air at a predetermined rate through a bubbler pipe dropped into liquid. It can be engineered for automatic control of any number of pumps, valves, alarms, and indicators. *Automatic Control Co.*

17 **PREVENT DOWN TIME,** new Caterpillar booklet, discusses preventive maintenance. Illustrations show how the Caterpillar dealer offers complete facilities for maintenance of equipment. *Caterpillar Tractor Co.*

18 **BULLETIN NO. 679** gives complete information on new equipment developed for those who are faced with the problem of efficient maintenance and service on large numbers of lubricated valves. High-pressure, portable lubricant pump, high-pressure hand gun, and a line of extreme-pressure grease fittings are described and illustrated in detail. *Lincoln Engineering Co.*

19 **A GUIDE TO THE USE OF SEAMLESS MECHANICAL TUBING** is a new bulletin described to help tubing user in determining whether he should use hot finished, cold drawn, or "roto-rocked" seamless mechanical tubing as the basis for his product. *The Babcock & Wilcox Co., Tubular Products Division.*

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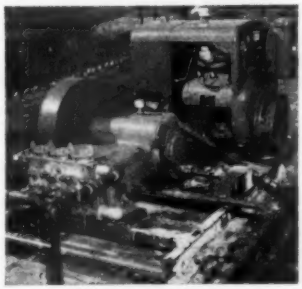
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

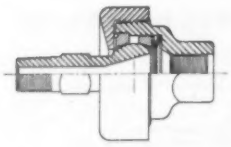
by Dan B. Miller

20 WISCONSIN-POWERED OIL PUMP is designed to take care of oil-field problems such as high-pressure transportation of crude oil (high or low-gravity, sweet or sour), salt-water disposal, and pilot floods. The unit is made in two sizes, 30 and 50 bbl. per hour at 1,000 psi., discharge pressure, the smaller unit being powered by a Wisconsin air-cooled field model VF4, 20-hp.; and the larger one by a Wisconsin VP4D 30-hp. power unit. Various accessories are available for these two units but they are both fitted with stellite exhaust valves and seats, low oil cutoff switches, and lubricating oil filters especially designed for their low-pressure lubricating system. They can be operated on gasoline, natural gas, or butane. The pump is a horizontal single-acting triplex with fluid end constructed of acid-resistant bronze with stainless-steel fittings. Valves are flat disk type, spring actuated. *Harley Sales Co.*

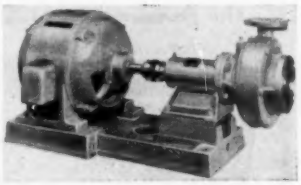


IT'S NEW CHECK IT

21 FIREPROOF BALL JOINTS FOR 7,500-PSI. WORKING PRESSURE. Produced in steel and alloy steel, the design differs somewhat from lower-pressure joints in that the inner seal on the ball is a free-floating part carried under constant spring pressure. This insures positive, leakproof sealing at low or zero pressure and also makes the joint easy to turn and move. All steel construction and metal seals provide complete protection against fire. Joints of this type are of rugged construction and are particularly suitable for applications in the petroleum-producing field. These joints are offered in five sizes: 1, 2, 2½, 3, and 4-in. *Barco Manufacturing Co.*



22 TYPE CTB CHEMICAL TRANSFER PUMP is characterized by the use of a mechanical shaft seal in place of the usual stuffing box and by use of a stainless-steel alloy for the wetted end. The new pump is available for continuous or intermittent duty in transferring process chemicals, including acids, bases, salts, organic, and inorganic solutions in all concentrations. Characteristics of the pump include horizontal end suction, top discharge design, with a vertically split case. Built in four sizes, capacity range is from 10 to 250 g.p.m.; head range is from 10 to 140 ft.; horsepower range is from 1 to 10. Temperatures of liquids handled can be up to 250° F. maximum. Materials of construction include cast-iron frame and a liquid end of type No. 20 stainless-steel alloy. *Peerless Pump Division, Food Machinery & Chemical Corp.*



IT'S NEW CHECK IT

23 A LIGHTWEIGHT FIRE SHIELD, made of glass-fiber insulation, has been developed, enabling fire fighters to approach within a few feet of a fire with effective protection against radiant heat. Weighing only 26 lb., the shield can be carried by one man on the run over ditches or rough ground. At close quarters, the fireman can either direct operations, turn off valves, effect a rescue, or even fight the fire himself. The secret of the shield's heat-stopping power is a blanket of Ultra-lite glass-fiber insulation fitted to a framework of tubing. Working behind such a shield, a fireman has been able to approach within 18 in. of a high-pressure gas fire (850 psi. from a 6-in. pipe) in comfort and safety. The user maintains vision through a peep hole at eye level. His face is shielded by copper wire that disseminates and dissipates

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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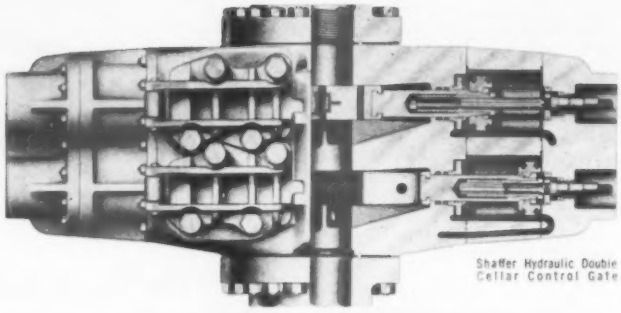
What to Look for when you buy CELLAR CONTROL GATES



Shaffer Hydraulic Double Cellar Control Gate

Cellar Control Gates are an item you don't buy every day. That's why it's so important that you double-check the equipment you buy to make certain it has all the features essential for today's drilling operations.

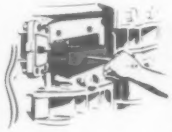
First—SAFETY...

and, of course, that is the MOST important single item. In Shaffer Hydraulic Cellar Control Gates you get safety backed by the organization that pioneered cellar control gates well over a quarter-century ago. But look deeper than safety alone . . .

Look for COMPACTNESS!

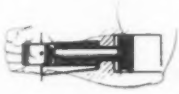
Equipment that is bulky and excessively large can take a high toll in greater rig costs, deeper cellar requirements, cumbersome hook-ups. But Shaffer Hydraulic **Double** Cellar Control Gates (**two** ram compartments unitized in **one** body) require only 30" total height even in sizes as large as 13⅝" (12" Series 900). Shaffer Hydraulic Single Cellar Control Gates require only 18½" in the same size. **Compare these compact dimensions with any other gate of comparable size and rating!**

Look for EASY RAM CHANGE!



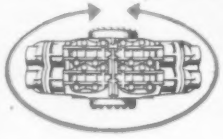
Rams must be changed frequently to meet requirements of varying pipe sizes as wells are drilled. In Shaffer Hydraulic Gates you simply open two doors in the side of the body, slide out the ram assembly, change rams, slide the assembly back in place and bolt the doors. **And complete ram changes can be made with equal ease whether the pipe is in or out of the hole!**

Look for SIMPLE DIRECT DRIVE!



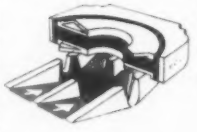
Note how Shaffer Hydraulic Gates have no complicated hook-ups or secondary connections between rams and operating cylinders. Operating pistons are **directly behind** the rams for direct fool-proof drive, fewer parts, positive simplicity!

Look for ENCLOSED DESIGN!



There are no exposed moving parts in Shaffer Hydraulic Cellar Control Gates. All operating members are enclosed within the gate body—protected from corrosive muds, from jamming by loose timbers, from abrasive grit and sand!

Look for MUD-FREE DRAINAGE!



No detrimental mud accumulations can interfere with free ram travel in Shaffer Gates because the rams move on high narrow guide ribs above the steeply-sloped ram compartment bottoms. Mud and sand quickly drain back into well—rams are always ready for use.

These and many other features make Shaffer Hydraulic Cellar Control Gates the outstanding choice of leading operators. Compare, point-by-point, and you'll see why! Your nearest Shaffer representative will gladly supply complete details on Shaffer equipment. Or write Direct!

Send for your free copy of the complete Shaffer Catalog!

See the Shaffer section—pages 4525 to 4600—of your 1951 Composite Catalog

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CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 300 Fifth Avenue, New York, N. Y., U.S.A.

29 YEARS OF OIL TOOL LEADERSHIP

heat. A self sealing opening for a hose nozzle is easily cut through the shield wherever desired. *Gustin-Bacon Manufacturing Co.*

IT'S NEW CHECK IT

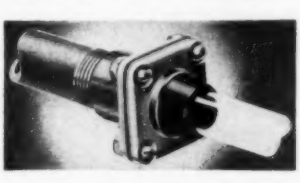
24 NEW THREADLESS STUBBY TUBING HEAD. Similar in construction to Alten's threaded stubby, this new head is made to meet the demand for a threadless, slipover type. It packs on tubing or coupling and is available as split or solid gland. Its squatty design brings well-head equipment low. *Alten Foundry & Machine Works, Inc.*

IT'S NEW CHECK IT

25 IMPROVED VERSION OF THE ORONITE ODOROMETER is an instrument which simulates a room test for determining the threshold detection, odor strength, and odor character of odorized natural gas or odorized L.P.G. The unit is housed in an aluminum case, and all parts which come in contact with odorized gas are of aluminum or glass. Working unit consists of a 110-volt constant-speed electric motor driving a small turbine blower. This unit delivers a constant volume of air, and into this air stream the odorized gas sample is measured through a rotameter. The air-gas sample is mixed in a tapered glass tube which has its outlet at the top of the case. "Sniff" tests of this effluent stream permit judging the characteristics and intensities of the odorized gas. By means of a calibration chart the per cent of gas in air from the initial detection point upward can easily be determined. The average range of the instrument is from something less than 0.1 per cent to slightly over 1 per cent. The Odorometer permits simulated room tests at any point on a distribution line. *Oronite Chemical Co.*

IT'S NEW CHECK IT

26 S.W.P. STANDARD BUTYRATE PIPE AND FITTINGS. A complete line of solvent welded pipe and reinforced fittings of virgin butyrate is now available in sizes ranging from ½ through 4-in. The fittings are quickly and permanently joined to the pipe by means of a solvent-type cement, which produces a homogeneous bond. Since threading of butyrate pipe is not recommended, the outside diameter differs from that of standard steel pipe to the extent that conventional pipe dies cannot be used. This o.d. sizing has been adopted by the Thermoplastic Pipe Standards Association. However, the rate of flow through S.W.P. is equal to the flow through standard steel pipe of the same nominal size. Several schedules of S.W.P. will be produced to meet various pressure requirements. In addition to the usual ells, tees, laterals, and couplings, a flange union is available for use when the line is to be disconnected. For joining the plastic pipe to standard steel pipe, a compact, rugged, leakproof flange-adaptor union (patents pending) is utilized. *Elmer E. Mills Plastics, Inc.*

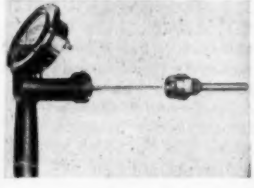


IT'S NEW CHECK IT

27 ROYAL NI-CLAD STEEL TAPE. The figures and graduations won't wear off, as they are an integral part of the steel. The hard nickel-plated surface makes the tough and durable line rust and corrosion resistant. Hook ring is furnished on this tape at no extra charge. The durable black markings are easy to read, as they stand out sharp and clear against the bright nickel background. The tape is also easy to read because instantaneous markings (last preceding foot number repeated each inch) are used on it. The rust-resistant welded metal case liner is covered with tough dark green vinyl. Folding flush handle opens with push pin. Plated trim. *The Lufkin Rule Co.*

IT'S NEW CHECK IT

28 PORTABLE DIESEL ENGINE PYROMETER. A new portable diesel engine pyrometer is designed for test purposes and for installations where no permanently mounted pyrometer is available. The thermocouples can be installed in each cylinder and in the main exhaust line. Temperatures can then be checked at any time by inserting the pyrometer prongs into the corresponding receptacles in the terminal head of the thermocouple. *The Bristol Co.*



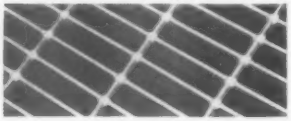
IT'S NEW CHECK IT

29 NEW CONSTANT FLOW VALVE puts an end to the problem of clogged orifices and the limiting factor of fixed orifices. In this new Type CMC gas-lift valve, an increase of gas pressure above normal operating pressure will draw the stem entirely out of the seat and free it of all foreign matter. When the pressure is reduced the stem returns to normal operating position with a clean orifice. The CMC incorporates a special tungsten carbide

tip and seat. The larger taper of the stem is the seating surface against the seat. The lower shank of the stem remains inside the seat in normal operation. The diameter of the shank is variable in restricting the gas flow to the equivalent orifice required, and a greater flexibility is obtained in the control of gas necessary to efficiently aerate the flowing fluid column. By increasing or decreasing the annular pressure above or below normal operating pressure, an increase or decrease of gas is admitted into the tubing string. The CMC constant-flow valve is designed for use in retrievable valve installation. *Camco Co.*

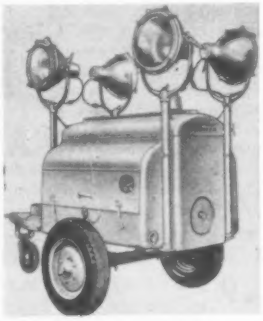
IT'S NEW CHECK IT

30 KLEMP-KREST. The new welded grating features round steel cross bars so formed as to provide a peak, or crest, on the top side of the bar. These bars are placed at right angles on top of flat bearing bars set on edge and then electrowelded under great pressure. This new crested cross bar adds many new advantages. The roundness of the bar which forms cross braces between the bearing bars gives greater tensile strength and makes a stronger weld, thus effecting perfect distribution of load, or impact, in every direction over the area of each section. The crested top provides a ridge between each bearing bar; thereby not only making this grating increasingly safe to walk on, but adding maximum nonslip characteristics. *Klemp Metal Grating Corp.*



IT'S NEW CHECK IT

31 TRAILER MOUNTED GAS-ELECTRIC FLOODLIGHT AND POWER-SUPPLY UNIT is integral unit consisting of a Winpower-5 kw., 115-volt a.c. generator, powered by a Wisconsin four-cylinder air-cooled engine. Four 80,000-c.p. floodlights are mounted, which can be raised to 8½ ft. and aimed in any direction. Operating equipment includes lighted control panel with duplex receptacles for power tools, for emergency power needs or extensions to separate floor lights; fused circuits; rheostat voltage regulator; automatic circuit breaker; separate switches for each light; and two builtin, side-mounted tool boxes. This unit is mounted on a two-wheel, pneumatic-tired trailer with heavy-duty, multiple-leaf steel springs and retractable caster wheel for parking. The plant will operate four 80,000-c.p. floodlights or a 7,000,000-c.p. searchlight, plus other electric equipment. It can well serve as an emergency 5,000-watt power plant which can be rapidly transported to any location where power failure has occurred. *Winpower Mfg. Co.*

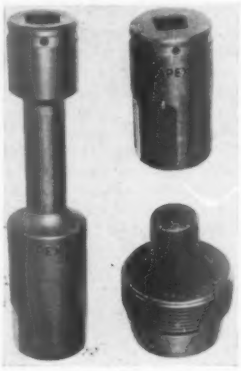


IT'S NEW CHECK IT

32 A NEW METHOD OF PACKAGING U-BEND TUBES FOR HEAT EXCHANGERS AND CONDENSERS. The package is an expendable wooden pallet. Features important to users are ease of inspection and removal in sequence required. Complete sets of tubes for condenser installation can be shipped in one pallet. Use of pallet lowers tube unloading, installation and handling cost, and storage space. The main advantage is that all tubes can be fed directly from the shipping pallet into heat exchangers or condensers as they are needed. *Wolverine Tube Division of Calumet and Hecla Consolidated Copper Co.*

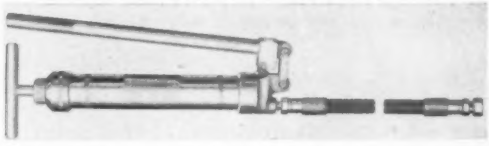
IT'S NEW CHECK IT

33 A NEW SERIES OF SOCKETS is designed for setting and removing bull nuts on preheaters of cracking unit furnaces. These square drive sockets will fit any popular make of power tool and are available in a range of hex openings to accommodate all standard sizes of bull nuts. First field tests on these sockets were begun several months ago at a Midwest refinery, where they are still in continued use. Although considerably lighter than the tools formerly used for this type of work, Apex bull nut sockets provide long service life and an economical solution to one of the most persistent of refinery-maintenance problems. *The Apex Machine & Tool Co.*



IT'S NEW CHECK IT

34 HIGH-PRESSURE VALVE-LUBRICANT GUN. The job of removing the lubricant screw each time a lubricated valve is serviced is eliminated through the use of this screw-type lever gun and fitting. Through the use of a positive mechanical screw prime, the new gun will develop a pressure of 10,000 psi. which is more than ample to force lubricant through all parts. The gun will effectively dispense both bulk and cartridge lubricants in all kinds of weather. It is of heavy-duty steel construction and comes equipped with a whip hose and coupler for ease on contacting hard-to-reach valves. *Lincoln Engineering Co.*



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Here's how to save 3-ways with NO-OX-ID:

1. NO-OX-ID weighs less and covers more pipe per pound than other materials, which means substantial savings in freight and handling costs.
2. With NO-OX-ID you coat more feet of pipe per man-hour because you are handling less material and pipe line crews prefer working with NO-OX-ID.
3. NO-OX-ID applications require less equipment in the field —fewer "dope" kettles, trucks and "cats" mean reduced construction costs.

You can have NO-OX-ID's superior protection and this 3-way saving, too, in a coating combination designed to fit the requirements of your job. Consult your Dearborn engineer for specific advantages accruing to users of NO-OX-ID pipe line coatings.

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Among the Drilling Contractors

Downing Leaves Iverson To Join Drilling Company

Hugh B. Downing, lately secretary-treasurer of Iverson Supply Co., Tulsa, has acquired an interest in Johnn Drilling Co., Fort Worth, and has become associated actively with that company as secretary - treasurer. He purchased an interest from the estate of the late Ed Peters, formerly vice president of the drilling company.

H. B. DOWNING

Downing enters the drilling business after 16 years' service with various oil - field supply firms. Prior to his connection with Iverson Supply Co., he had been associated in turn with Oil Well Supply Co. and Continental Supply Co. He is a graduate of the University of Arizona.

The drilling company, with which he has become associated, operates rotary rigs in West Texas and New Mexico. It is headed by Johney Cockburn as president, with Vernon E. Blain, vice president and drilling superintendent; E. E. Ray and O. G. Cheek, directors and tool pushers; and J. W. Arnold, assistant secretary-treasurer.

Trichel Contracting Co., Goodpine, La., has a rig working for Bering Oil Corp. and associates of Tyler, Tex., at a wildcat location ½ mile east of Lavaca, western Catahoula Parish, Louisiana. Objective is the Wilcox. Location is in 41-7n-5e.

E. A. Rumley Drilling Co., Oklahoma City, is starting another well for Jay Simmons of Dallas in the new Pennsylvanian sand area just east of the Oklahoma City limits on the east flank of the Oklahoma City field, Oklahoma County, Oklahoma. The new operation, projected to 6,500 ft., is 1 Knox, with location in the SE SW SW 7-11n-2w.

Murfin Drilling Co., Wichita, Kans., has contracted with Berry & Frik of Tulsa for two wildcat tests to be drilled in the Saline area of Saline County, Kansas. One, 1 Millikin, is located in the SE SW SW 14-15s-3w, west of the small Menton pool, 6 miles south of Saline. The other, 1 Hoeffner, is in the NW NW SW 23-14s-2w, 3 miles east of the Saline pool and 5 miles east of the town of Saline.

Doak Drilling Co., Bristow, Okla., is keeping a rig busy in the new extension area of the Rich Valley field, Grant County, northern Oklahoma, where it is drilling for Oras A. Shaw of Tulsa, one of the owners of the company. Latest operation is 3 Hays, SW NE NW 36-26n-5w. Pay zone in the area is the second Wilcox sand, encountered at depths of 5,800 ft. to 5,850 ft.

Warren Drilling Co., Tulsa, is doing the drilling for Helmerich & Payne, Inc., Tulsa, at a Bartlesville sand test the latter firm has undertaken at a wildcat location 8 miles northeast of Newkirk, northern Kay County, Oklahoma. Location, in the SE SE SW 28-29n-3e, is for 1 Lashbrook. Objective is around 3,000 ft.

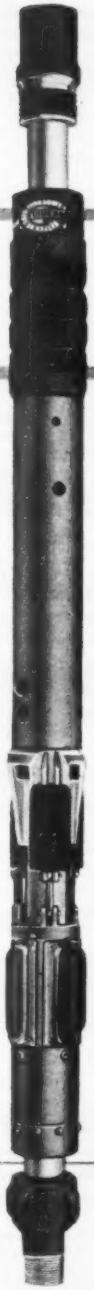
Justiss-Mears Drilling Co., Jena, La., is drilling a projected 3,100-ft. Wilcox exploratory test for Chicago Mill & Lumber Co. at 1-B Mutual, located in 1-11n-9e, ½ mile north of the North Holly Ridge field, Tensas Parish, Louisiana.

L. B. Jackson, Tulsa, has a contract with Youngblood & Youngblood of Oklahoma City for a 5,800-ft. Wilcox test, 1 Bartlett, located in the C SW NE 4-27n-8w, 3 miles west of Sand Creek, Grant County, Oklahoma.

Carpenter Trant Drilling Co., Denver, is working on a 4,000-ft. Madison test at a wildcat location in the Frost Ranch area, Park County, Wyoming. Lion Oil Co. is the operator with location in the NE SW NW 17-51n-101w.

Rainbow Drilling Co., El Dorado, Ark., has a wildcat operation under way west of Clarkedale, eastern Crittenden County, Arkansas, where it is drilling for J. K. Dobbs. Location is for 1 Bond, in 16-8n-8e. Contract is for 5,000 ft.

Delta Drilling Co., Tyler, Tex., has moved a rig to a wildcat location 2 miles south of Hughes Springs, in Cass County, East Texas, where it will drill for Humble Oil & Refining Co. The Humble wildcat is 1 Turner. Location



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■ Type "LC30" with 30″ valve travel is also available and either type may be purchased with perforated mandrel on special order.

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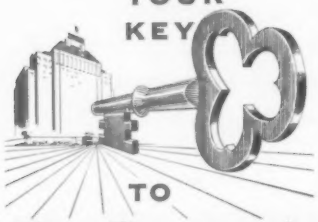

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is in the Isaac Campbell Survey. This contractor also has another new operation under way for Sam Y. Dorfman in the Willow Springs field, Gregg County, at 1 Fisher, S. P. Ford Survey.

Trans-Tex Drilling Co., Longview, Tex., is drilling for Lyons, McCord & Logan at a wildcat location in the Como field area, 7 miles south of Como, Hopkins County, eastern Texas. Location is for 1 McGill in the Nacogdoches University Survey. Hole will go to 4,300 ft.

Cooper-Herring Drilling Co., Longview, Tex., has contracted for a 4,000-ft. test which F. R. Jackson and J. M. Deupree have undertaken in the J. T. Vonderhouse Survey, 8 miles southeast of Terrell, Kaufman County, Texas. The test is designated as 1 Willson.

J. C. Trahan Drilling Co., Shreveport, has been awarded a contract by Natural Gas & Oil Corp. for a 7,000-ft. test to be drilled on the Jamestown prospect in Bienville Parish, Louisiana. Location is in the SE SE NE 32-16n-8w, on the operator's Whatley lease. Objective is the Sligo formation.

Penguin Petroleum, Inc., Wichita, Kans., contracting for Kenneth Ellison, has a rank wildcat test under way in Lincoln County, Kansas. Location is in the SW NW SE 9-12s-7w, 2 miles southeast of the town of Lincoln. It is more than 30 miles from nearest production in the Saline basin.

Norwood Drilling Co., Wichita Falls, Tex., has the contract for a deep test, 1-B Adams, which Deep Rock Oil Corp. will drill in Meade County, southwestern Kansas. Location, in the C NW NE 16-35s-29w, southeast of Adams Ranch gas area, is a half mile north of the Oklahoma line.

ACTIVE ROTARY RIGS*
(United States and Western Canada)

Area—	Week ended 8-25-52	Change week ended 8-18-52	8-27-51
Gulf Coast	478	—34	—114
N. & W. Tex.-N.M.	734	+2	—238
Ark.-N. La.-E. Tex.	127	+2	—33
Oklahoma	289	—5	—15
Kansas-S. Nebraska	146	+2	—36
Illinois-Eastern	141	+8	—9
Rocky Mountains	238	+13	+61
Pacific Coast	160	+3	—26
Total U. S.	2,313	—6	—410
Western Canada	157	—2	+6
Total	2,470	—8	—404

*Courtesy Hughes Tool Co. Trends in drilling activity in the United States and the Gulf Coast and Arkansas-North Louisiana-East Texas areas are shown on pages 158 and 159.

Mountain States Drilling Co., Denver, has contracted with a group of Tulsa operators, including Olney Flynn, C. L. McMahon, and G. C. Parker, for a 3,000-ft. test on the Big Sheep Mountain prospect in Big Horn County, Wyoming. Location of the test, 1 Great Western, is in the SW SE SW 35-54n-94w.

Pennant Drilling Co., Casper, Wyo., has a 7,000-ft. wildcat operation under way for Shell Oil Co. at Shell Creek, in Sweetwater County, Wyoming. The test is being drilled as 1 Unit, with location in the C NE NE 36-14n-97w.

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holds its own...

...and then some!

POSITIVE NON-SLIP GRIP

Like a giant hand might grip a thread —so the Safe Line Clamp holds wire rope in a positive non-slip grip.

The clamp is made in two parts, the inside of which is splined and the outside threaded top and bottom. The splines or spiral grooves grip the strands of the wire rope as the two parts of the clamp are placed together over the rope. Nuts over each end of the splined "grips" are tightened to complete the clamping action.

No dangerous wire ends protrude from the Safe-Line Clamp and its holding power is equal to several ordinary "U Bolt" clamps. The clamp may be reused repeatedly.

Get *all* of these features plus *extra safety.* Standardize on National Safe Line Clamps wherever wire rope is held together.

THE NATIONAL SAFE-LINE CLAMP IS STOCKED BY LEADING INDUSTRIAL SUPPLY DISTRIBUTORS

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This Oakite 384 Steam Detergent gun hits dirt with heat, force, powerful Oakite detergent. Breaks up, floats off even heaviest soils, no matter how hard to reach. Lifts cleaning spray up to 12 feet above working level.

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REFINING

Carter to Erect Poly Unit, Auxiliary Boiler at Billings

BILLINGS, Mont.—Carter Oil Co. has let a turnkey contract to the chemical-plants division of Blaw-Knox Co. for design, procurement, and construction of a 600-bbl. catalytic polymerization unit and a waste-heat boiler auxiliary to the present cat cracking facilities at the company's refinery here.

The poly unit will be a high-pressure shell and tube-type reactor unit employing solid phosphoric acid catalyst. Feed will be 3,700,000 cu. ft. daily of cracking-plant gas. Product will be 100-plus octane polymer, which will be used for blending premium-grade motor fuels. The poly unit will go on stream early next year.

Construction will begin in September on the waste-heat boiler installation, which will recover heat from flue gases of the cat cracker and increase plant steam-generating capacity by 22,000 lb. hourly.

Standard of Texas Soon to Operate New Houdriflow Cat

EL PASO, Tex.—Construction of a 10,400-bbl. Houdriflow catalytic cracker is being pushed at Standard Oil Co. of Texas' refinery here, and the unit should be ready for operation by October 1.

M. P. Paret, Jr., Standard vice president in charge of refining, said the new unit will cost about $3,800,000. It is being erected by Catalytic Construction Co., Philadelphia.

The cracker is part of an over-all refinery-expansion program estimated by the company to require expenditures of about $10,000,000.

It includes erection of a vacuum flasher, synethetic crude-distillation unit, an alkylation plant with an output of about 1,400 bbl. of 100/130 octane product daily, and miscellaneous facilities.

Elk Refining's Reforming Unit on Stream This Week

FALLING ROCK, W. Va. — Elk Refining Co.'s new 1,500-bbl. catalytic reforming unit at its refinery here is scheduled to be checked out on its initial run this week.

The unit is the first of its kind in the state and will employ two new features.

The first involves equipment for protecting and lengthening useful life of the catalyst. Arsenic, sulfur, and other contaminating elements will be removed largely by treating the raw feed stock. Equipment for protecting the platinum-alloy catalyst consists of a Petrochem heater, two clay-treating towers with bauxite filters, heat exchangers, and a multistage pump.

The other feature is a newly-designed

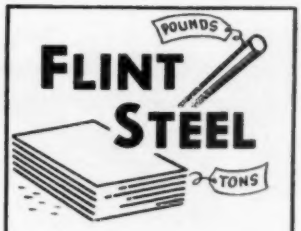
NELSON REFINERY CONSTRUCTION INDEX

Appears in the first issue each month.
Explanation—"New Items That Appear in Quarterly Cost Indexes," July 7, 1952, page 105 and 106.
Compiled by W. L. Nelson—Petroleum Refinery Consultant of Tulsa.
Indexes of Individual Equipment Items—January, April, July, and October.

INDEX (1946 = 100)

	1948	1949	1950	1951	1952
Pumps, compressors, etc.	127.0	135.9	138.2	155.9	155.6
Electrical machinery	127.6	130.9	134.9	154.3	153.0
Internal combustion engines	116.9	124.8	126.0	146.1	145.8
Instruments	120.0	122.0	127.8	142.3	142.4
Heat exchangers	130.0	133.0	140.0	152.0	163.0
Miscellaneous equipment average	*122.1	*121.6	*126.2	*145.1	152.0
Materials component	139.3	143.6	149.3	164.0	162.3
Labor component	128.0	137.1	144.0	152.5	159.5
Refinery construction index	132.5	139.7	146.2	157.2	160.6

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the Miscellaneous Equipment items shown above.



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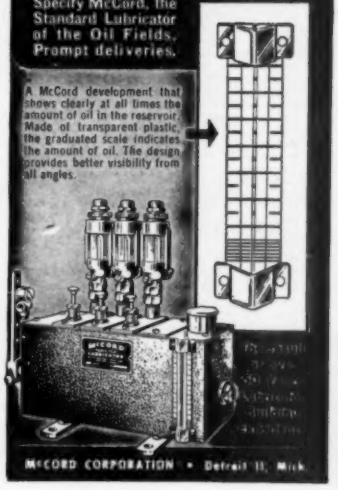
A McCord development that shows clearly at all times the amount of oil in the reservoir. Made of transparent plastic, the graduated scale indicates the amount of oil. The design provides better visibility from all angles.
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Taylor "Graphitrol" graphic-control panel. This equipment provides a flow-sheet picture right on the control board.

Biggest Plant-Maintenance Meet Set for January 19-22

CLEVELAND.—Plans are progressing for what is termed the greatest plant-maintenance conference and show ever held.

Scheduled for the public auditorium here, January 19-22, 1953, the conference will comprise 66 sessions covering maintenance in 11 industries, including petroleum refining and chemical manufacturing.

Panel discussions will touch on planning and scheduling maintenance work, costs and budgets, training, standards and measurements. Other conferences will be concerned with preventive maintenance and corrosion control of all types of equipment in plants of varying size.

The exposition is expected to be 75 per cent larger than the one held early this year, according to Clapp & Poliak, Inc., New York, which conducts the conference.

Sulfur Plant Operating

WHITING, Ind.—Standard Oil Co. (Ind.), has placed its new sulfur-extraction plant on stream at the refinery here.

The unit is extracting hydrogen sulfide from the refinery's byproduct fuel gases and converting it into sulfur of 99.9 per cent purity.

Most of the unit's 55-ton-daily capacity will be converted to sulfuric acid in existing plant facilities for use in alkylation and treating operations.

Refining Briefs

Ohio Oil Co. has let contract for installation of an 8,000-bbl. catalytic reforming unit at its Robinson, Ill., refinery to Houdry Process Corp., Philadelphia. Construction will be carried out by Catalytic Construction Co. under supervision of Houdry. Completion is scheduled for late 1953.

Socony-Vacuum Oil Co., Inc., has awarded $3,500 jointly to Joseph W. Darby and John Moran, operators at the firm's Paulsboro, N. J., refinery for a suggestion under the company's suggestion system which brought about a reduction in shutdown time and in loss of solvent used by the refinery's Duo Sol unit, which processes high-grade lubes. The award is the largest ever made by Socony for a single suggestion.

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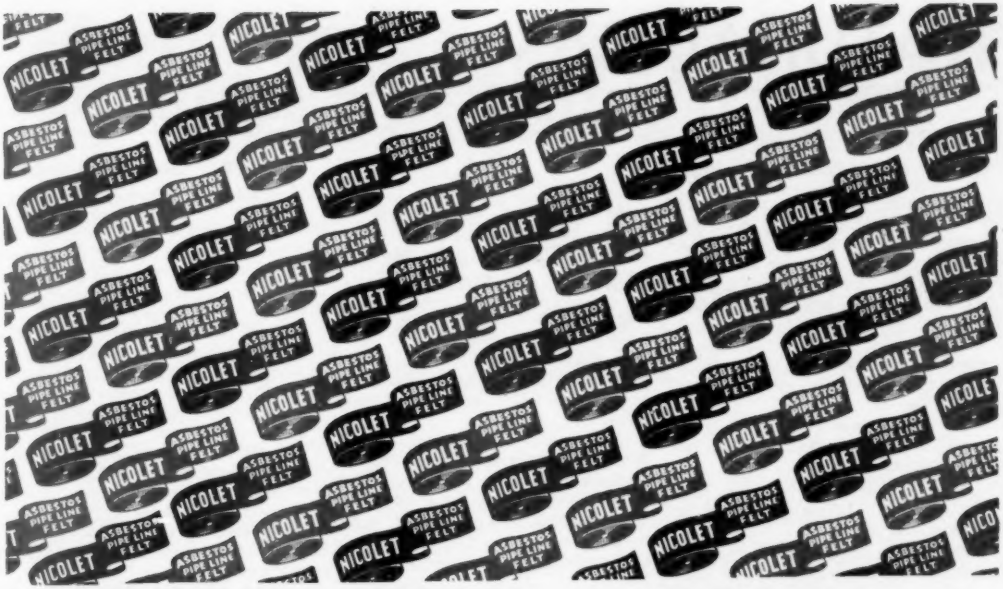

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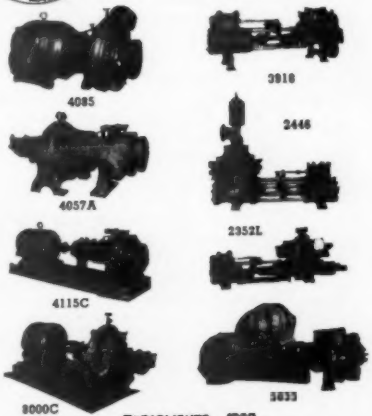

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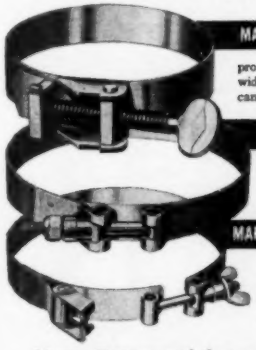

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NATURAL GAS

Ohio Fuel Plans Boost in Underground-Storage Volume

COLUMBUS. — Plans to spend $5,400,000 during 1952 to boost the capacity of its underground-storage system by 13 per cent were announced last week by Ohio Fuel Gas Co. here.

Currently, the total underground-storage capacity of Ohio Fuel totals 100 billion cubic feet in five former gas-producing reservoirs. These storage reservoirs are located in the central part of Ohio.

The 1952 expansion program is expected to raise this figure to 115 billion cubic feet.

As of November 1951, Ohio Fuel had nearly 62 billion cubic feet in underground storage.

The coastal outlay will include the addition of 100 or more facility wells to supplement the 625 wells in operation throughout the company's storage system at the end of 1951.

To build up its underground-storage program, Ohio Fuel spent almost $12,500,000 in the 5-year period ended January 1, 1952. Today, underground storage supplies as much as 45 per cent of Ohio Fuel's requirements on peak days.

The firm is a subsidiary of Columbia Gas System, Inc.

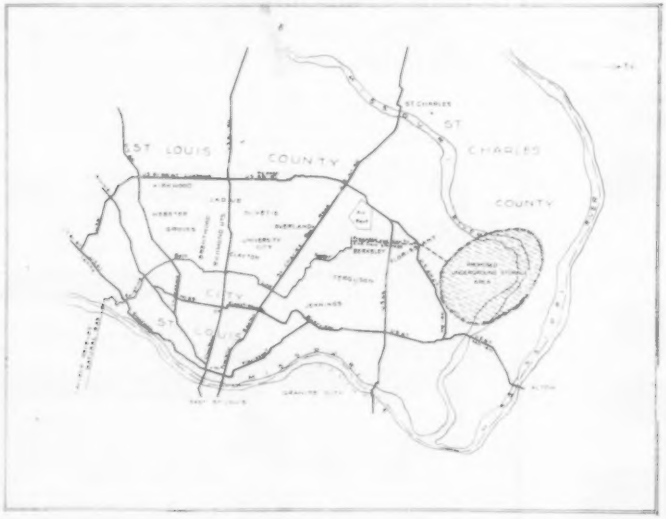
Phillips Operating Its New Crane County Sulfur Plant

BARTLESVILLE, Okla. — Phillips Chemical Co. has completed and placed in operation its new sulfur-extraction plant near the company's Crane natural-gasoline plant in Crane County, Texas.

Design production capacity, 100,000 lb. of sulfur daily, has already been exceeded by more than 10 per cent. This is the second Phillips plant placed in operation this year to extract sulfur from natural gas. The other, near Goldsmith, Tex., went on stream in February.

Sulfur from the Crane County plant will be trucked in the molten state to a railroad spur 38 miles away, where it will be loaded into tank cars for delivery to its ultimate destination.

Present plans call for this sulfur to be converted into sulfuric acid for subsequent manufacture into ammonium sulfate at the company's Adams Terminal plant near Houston.



Sandstone Dome Investigated

The cross-hatched area on the map comprising about 25,000 acres is expected by Laclede Gas Co., of St. Louis, to provide a reservoir after development capable of storing underground more than 20 billion cubic feet of natural gas. The storage formation, now undergoing advanced geological work, lies about a third of a mile beneath the surface. The projected reservoir is located in St. Charles and St. Louis counties in Missouri. The project is estimated to cost about $10,000,000 (The Oil and Gas Journal, July 21, page 121).

Natural Gasoline

California Group Presenting Unusual Convention Program

LOS ANGELES. — The California Natural Gasoline Association is looking forward to something new in the way of conventions at its twenty-seventh annual fall meeting October 9-10.

R. W. Heath, of Signal Oil & Gas Co., general chairman, said the meeting here in the Ambassador Hotel this year will be concerned primarily with recent trends and developments in all phases of the petroleum industry—not just with the natural-gasoline portion of it.

Heath said the committee realized in planning the convention that it is exceedingly difficult for any one member of the industry to keep abreast of all the developments in such a vast field of operation.

The opening day of the meeting will present a program of forums covering engines and compressors, process and design, plant and field lines, and testing. The general session, convening October 10, will hear discussions by authorities in the fields of automotive engines, Mid-Continent gasoline operations, geology, production and drilling, refining, and business and government.

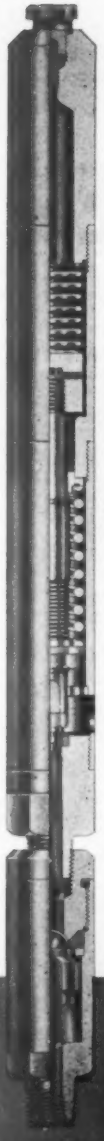
New Runnels Gas Products Corp. Plans $3,000,000 Plant

BALLINGER, Tex. — Plans have been announced for a combination pressure-maintenance, gas-dehydration, and gasoline-extraction plant for the Cree-Sykes field of northeastern Runnels County.

The proposed $3,000,000 project will be constructed and owned by Runnels Gas Products Corp., subsidiary of Union Sulphur & Oil Corp., Houston. Location is 20 miles northeast of Ballinger.

Frank B. Markle, vice president of the newly-formed Runnels Gas Products Corp., and its parent company, Union Sulphur & Oil, said the plant would conserve gas in the field. Its designed capacity will handle approximately 20,000,000 cu. ft. of gas daily to produce butane, propane, and natural gasoline. Operating personnel will number 25 persons.

Facilities of the plant will include 7,700 hp. in gas engine-driven compressors and 1,500 h.p. in gas engine-driven generators. The plant is designed for a maximum of air cooling, to conserve scarce water.



Do Clogged Orifices

throw your wells

OUT OF KILTER?

Camco has recently introduced a new constant flow valve which puts an end to the problem of clogged orifices and the limiting factor of fixed orifices. Thus, Camco has again pioneered another outstanding advancement in gas lift equipment, having worked on the new development for several years.

In this new Camco Type "CMC" Gas Lift Valve, an increase of gas pressure above normal operating pressure will draw the stem entirely out of the seat and free it of all foreign matter. When the pressure is reduced back to normal, the stem returns to normal operating position with a clean orifice.

The operation of the Camco "CMC" Valve is superior to the present Camco Type "MC" constant flow valve. In addition, it incorporates a special tungsten carbide tip and seat. The larger taper of the stem is the seating surface against the seat. The lower shank of the stem remains inside the seat in normal operation. The diameter of the shank is variable in restricting the gas flow to the equivalent orifice required. A greater flexibility is obtained in the control of gas necessary to efficiently aerate the flowing fluid column. By increasing or decreasing the annular pressure above or below normal operating pressure, an increase or decrease of gas is admitted into the tubing string.

The Camco Type "CMC" constant flow valve is available for use in retrievable valve installations.

Contact your Camco representative or write for details of this newest development by Camco, the leader in the gas lift field.

Patent Number 2,463,060. Other patents applied for.

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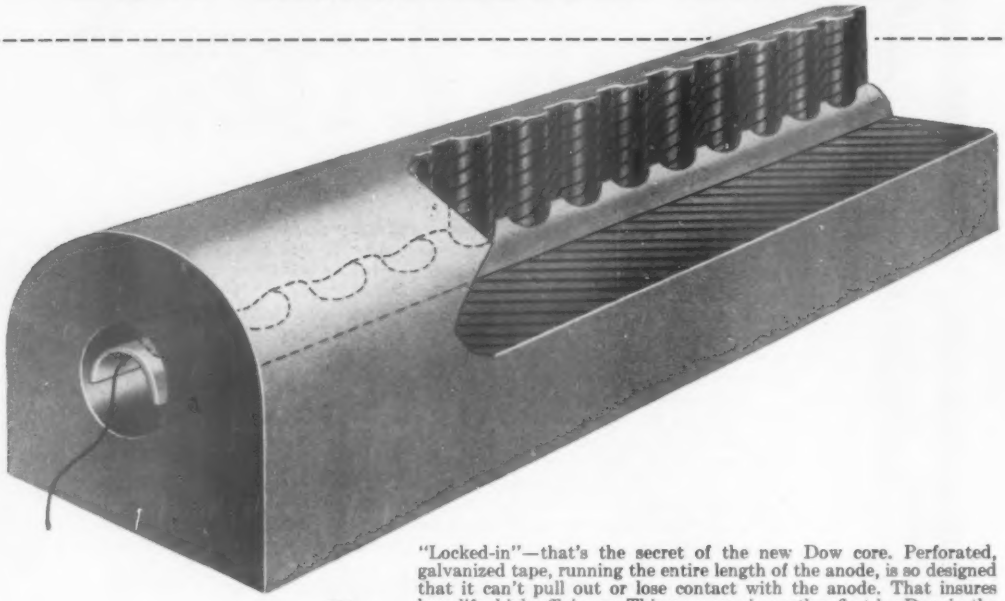

Plus new shape for special applications!

"Locked-in"—that's the secret of the new Dow core. Perforated, galvanized tape, running the entire length of the anode, is so designed that it can't pull out or lose contact with the anode. That insures long life, high efficiency. This new core is another first by Dow in the field of magnesium anodes.

Another feature of great interest is the new shape of Dow magnesium anodes. Employment of a different casting technique has resulted in a greater size flexibility than ever before available. It is now possible to order anodes that are practically "custom-tailored" to meet your specific requirements. The shape of the anode has changed from the tapered "D" to a "D" shape of uniform cross section. This makes possible a wide range of lengths for special applications at little or no extra cost. Of course, Dow will continue to make the standard size anodes that have been popular so long—with the new core.

Place your order today and take advantage of these new features that mean better protection at lower cost for you!

Contact the nearest Dow Sales Office or one of the Dow Magnesium Anode Distributors listed below!

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PIPE LINES

Champion Confident

Texas-Ohio chief looks for immediate FPC o.k.

HOUSTON.—Frank Champion, president of Texas-Ohio Gas Co., said last week he expects the Federal Power Commission to approve promptly the company's application to build a Texas-to-West Virginia natural-gas trunk line and to import gas from Mexico when the hearing reconvenes early this week.

Champion said the company will present full and complete evidence of its gas commitments, deliverability, and geology reflecting reserves at the hearing September 2.

He said the company previously had complete evidence required for authorization of construction when internal strife within the company caused confusion as to many of the line's gas commitments. He said FPC permitted the company a recess to resolve its difficulties.

Texas-Ohio has redeveloped its case, he said, and now has completed gathering geological proof that it has 20-year reserves to justify construction.

The company's proposed line would extend 1,406 miles from the United States-Mexican border in Hidalgo County, Texas, to a terminus near Spencer, W. Va.

Extended hearing . . . The initial hearing commenced April 15 and was adjourned by the commission on April 17, when an FPC staff counsel filed a motion to dismiss the application. Oral arguments were heard on the staff motion June 6, and the hearing was ordered to reconvene July 7. The continued hearing lasted from July 7-14 and was adjourned again on request of the company until August 4. At the conclusion of this session, the company applied for a 30-day recess, which was granted by the presiding examiner.

The motion to dismiss by staff counsel was filed on the grounds that the company had not submitted required data showing that it had a market for the gas it would carry through the new line.

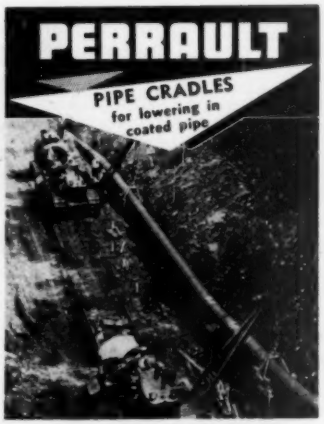
Price Moves Two Spreads To New Job by River Barge

BARTLESVILLE, Okla. — Barging contracting equipment long distances to new locations is something new in pipe lining.

H. C. Price Co. now is moving by barge the second of two spreads down the Ohio and Mississippi Rivers from work on the Texas Eastern Transmission Corp. 30-in. project to the 365-mile section contracted by Price for Texas Gas Transmission Corp.

Last week Price's No. 2 spread, under R. L. (Bob) Ezell, superintendent, started down the river in five barges

FOUR OF FIVE BARGES used are loaded here with 1,750 tons of pipe-line-construction equipment of Price Spread No. 4 for transportation from Fly, Ohio, to Greensville, Miss.



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HOW SLOW?

10 years 20 years 30 years

Leak Detector Model 24-101A *detects, locates* and *measures* any leak down to the almost unbelievably minute range where it would require 31 years for one cubic centimeter of gas to escape.

HOW EXPENSIVE?

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This instrument is also ideal for less critical work—checking industrial vacuum equipment, high pressure cylinders, compressors moving on an assembly line, valves, welded and soldered joints. Write for Bulletin CEC 1801.

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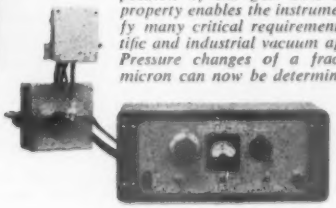


from Moundsville, W. Va., on a 900-mile trip, taking 5 to 6 days.

By highway, the distance to the final destination at Dyersburg, Tenn., would be about 750 miles. Unloading is done in 2½ days. The spread will be laying pipe about September 8.

In the middle of July, Price moved its No. 4 spread under Charles H. Ice, superintendent, on a 1,280-mile trip by barge from Fly, Ohio, near Wheeling, W. Va., to Greenville, Miss.

Sunray Consolidates Lines In New Operating Division

TULSA.—Sunray Oil Corp.'s various pipe-line systems and those of its subsidiary pipe-line companies have been consolidated into one operating division of the company's manufacturing, sales, and pipe-line department.

H. W. Manley, vice president in charge, said the consolidation has been carried out to obtain a more uniform and efficient operation of all pipe-line systems operated by Sunray.

J. R. ELLIS

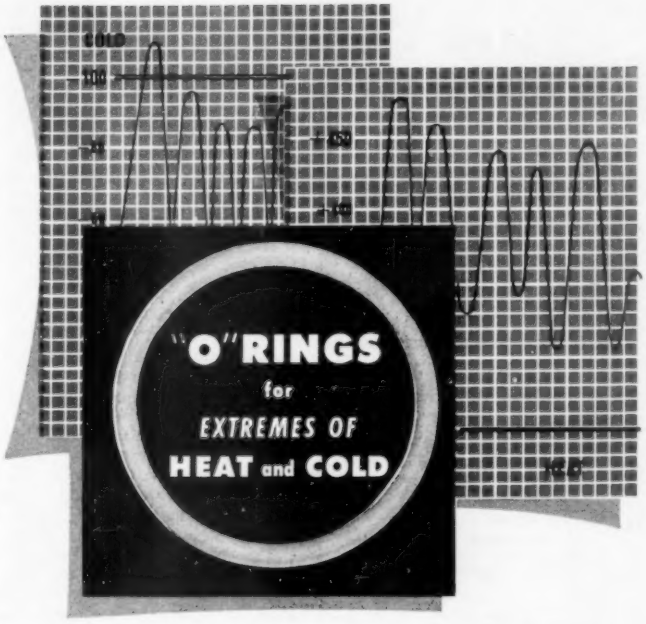
J. R. (Dick) Ellis has been named division manager of the company's new pipe-lines and terminals division. R. E. Sleppy will be assistant manager.

Superintendents of the various pipeline segments will be: George Martin, superintendent of Sunray Coastal Pipe Line Co., Victoria, Tex.; C. V. Bishop, chief operator, Duncan-Allen, Okla., utilities pipe line, Wynnewood, Okla.; R. T. Plaisance, superintendent of Sunray Pipe Line Co., Bristow, Okla.; M. E. Carroll, chief operator, Duncan, Okla.; R. E. Gilmore, superintendent, Allen pipe-line gathering system, Allen, Okla.; George Vaughn, superintendent of Velma pipe-line gathering system, Velma, Okla.

Interstate, Platte, Gulf Crude Lines Get Tax Aid

WASHINGTON. — Interstate Oil Pipe Line Co.'s new crude lines from Bayou Sale and Leesville, La., to Anchorage, La., have been approved for accelerated amortization by the Defense Production Administration.

For the Leesville-Anchorage line, DPA authorized quick write-off of 40 per cent of $45,000, 25 per cent of $1,818,600, and 20 per cent of $4,213,000. The Bayou Sale-Anchorage



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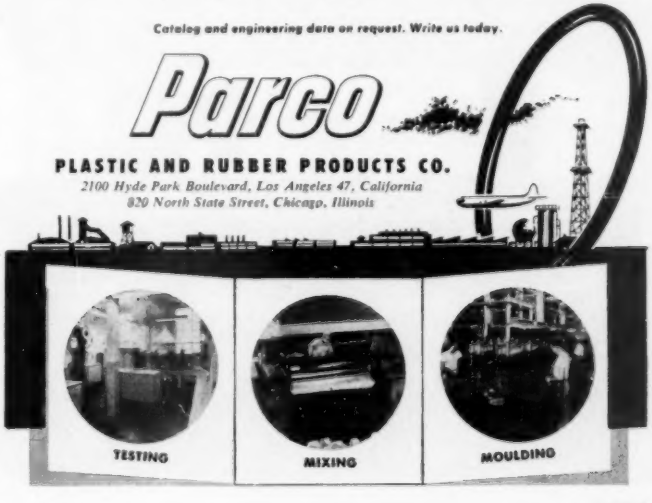

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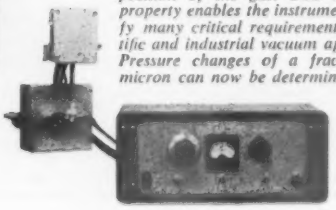

from Moundsville, W. Va., on a 900-mile trip, taking 5 to 6 days.

By highway, the distance to the final destination at Dyersburg, Tenn., would be about 750 miles. Unloading is done in 2½ days. The spread will be laying pipe about September 8.

In the middle of July, Price moved its No. 4 spread under Charles H. Ice, superintendent, on a 1,280-mile trip by barge from Fly, Ohio, near Wheeling, W. Va., to Greenville, Miss.

Sunray Consolidates Lines In New Operating Division

TULSA.—Sunray Oil Corp.'s various pipe-line systems and those of its subsidiary pipe-line companies have been consolidated into one operating division of the company's manufacturing, sales, and pipe-line department.

H. W. Manley, vice president in charge, said the consolidation has been carried out to obtain a more uniform and efficient operation of all pipe-line systems operated by Sunray.

J. R. ELLIS

J. R. (Dick) Ellis has been named division manager of the company's new pipe-lines and terminals division. R. E. Sleppy will be assistant manager.

Superintendents of the various pipeline segments will be: George Martin, superintendent of Sunray Coastal Pipe Line Co., Victoria, Tex.; C. V. Bishop, chief operator, Duncan-Allen, Okla., utilities pipe line, Wynnewood, Okla.; R. T. Plaisance, superintendent of Sunray Pipe Line Co., Bristow, Okla.; M. E. Carroll, chief operator, Duncan, Okla.; R. E. Gilmore, superintendent, Allen pipe-line gathering system, Allen, Okla.; George Vaughn, superintendent of Velma pipe-line gathering system, Velma, Okla.

Interstate, Platte, Gulf Crude Lines Get Tax Aid

WASHINGTON. — Interstate Oil Pipe Line Co.'s new crude lines from Bayou Sale and Leesville, La., to Anchorage, La., have been approved for accelerated amortization by the Defense Production Administration.

For the Leesville-Anchorage line, DPA authorized quick write-off of 40 per cent of $45,000, 25 per cent of $1,818,600, and 20 per cent of $4,213,000. The Bayou Sale-Anchorage

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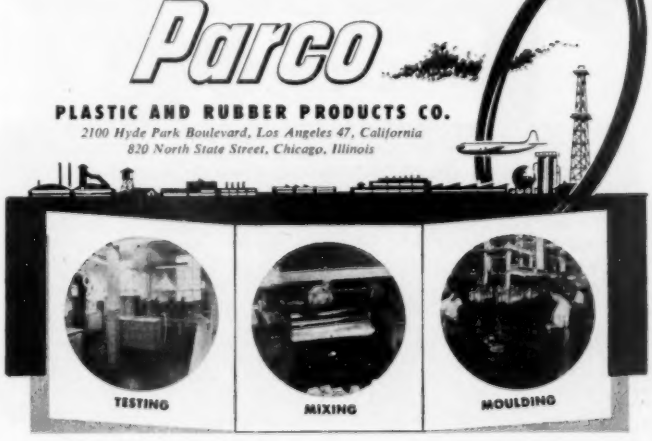

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line was granted 40 per cent of $50,000, 25 per cent of $107,000, 20 per cent of $691,000, and 15 per cent of $2,764,000.

DPA also approved accelerated amortization of 25 per cent of a $1,416,908 oil pipe line to be built by the Platte Pipe Line Co. between Holdrege, Neb., and Gower and Montgomery City, Mo.

Salt Lake Contracts New Products Carrier to Boise

SAN FRANCISCO, Calif. — Salt Lake Pipe Line Co., a subsidiary of Standard Oil Co. of California, has let contracts for construction of its projected 330-mile, 8-in. products line from Salt Lake City to Boise, Idaho.

The Salt Lake-to-Juniper, Idaho, section (130 miles) will be layed by Macco Corp. of Southern California. The remaining 200 miles to Boise is under contract to Engineers, Ltd., Pipe Line Co., San Francisco.

The $8,000,000 line is scheduled for completion by the end of this year. It will tie into existing takeoff points along its route in Utah and southern Idaho.

Salt Lake built its initial oil-products line to Boise 2 years ago and extended it later to Pasco, Wash. The new line will parallel the existing route. Its completion will increase capacity between the two points from the existing 22,000 to 39,500 bbl. daily. Salt Lake said it can raise this capacity, when necessary, to 45,000 bbl. daily by installing supplementary pump stations.

Transco Engages Company To Repair Narrows Crossing

NEW YORK.—Merritt-Chapman & Scott Corp. has been engaged by Transcontinental Gas Pipe Line Corp. to repair its damaged underwater line across the Narrows of New York Harbor.

The new 6,600-ft. crossing, one of the longest deep-water lines in the country, was fractured by the anchor of a Gulf Oil Corp. tanker July 27, just 33 days after it was laid. It had not yet been placed in operation delivering gas to the New York City utilities.

Transcontinental said Merritt-Chapman & Scott will use four or five derrick barges and auxiliary craft to pull several hundred feet of the line to the surface. The damaged section then will be cut out and replaced.

Interstate Contracts New 16-In. Louisiana Oil-Trunk

SHREVEPORT.—Interstate Oil Pipe Line Co. has let contract for construction of about 52 miles of 16-in. crude-oil trunk line between the company's Sunset, La., pump station in St. Landry Parish and Anchorage Terminal, West Baton Rouge Parish, to Houston Contracting Co., Houston.

The new line will replace Interstate's existing combination 8 and 10-in. trunk between the two points.

Construction is scheduled to get under way immediately and to be completed in November.

Pipe-Line Briefs

Platte Pipe Line Co. has moved its office from the Sinclair Building, Independence, Kans., to new headquarters on the twelfth floor of the building at 106 West Fourteenth Street, Kansas City 5, Mo., according to an announcement by Millard K. Neptune, president. The change becomes effective September 2.

Public Service Electric & Gas Co., Newark, N. J., has filed an application with the Federal Power Commission to build 16 miles of 16 and 10-in. line to carry natural gas received from Texas Eastern Transmission Corp. at Linden, N. J., to its gas works at Harrison and Jersey City, N. J.

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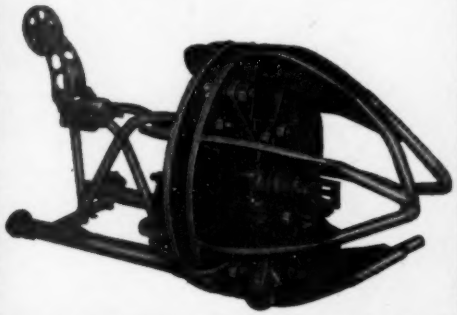

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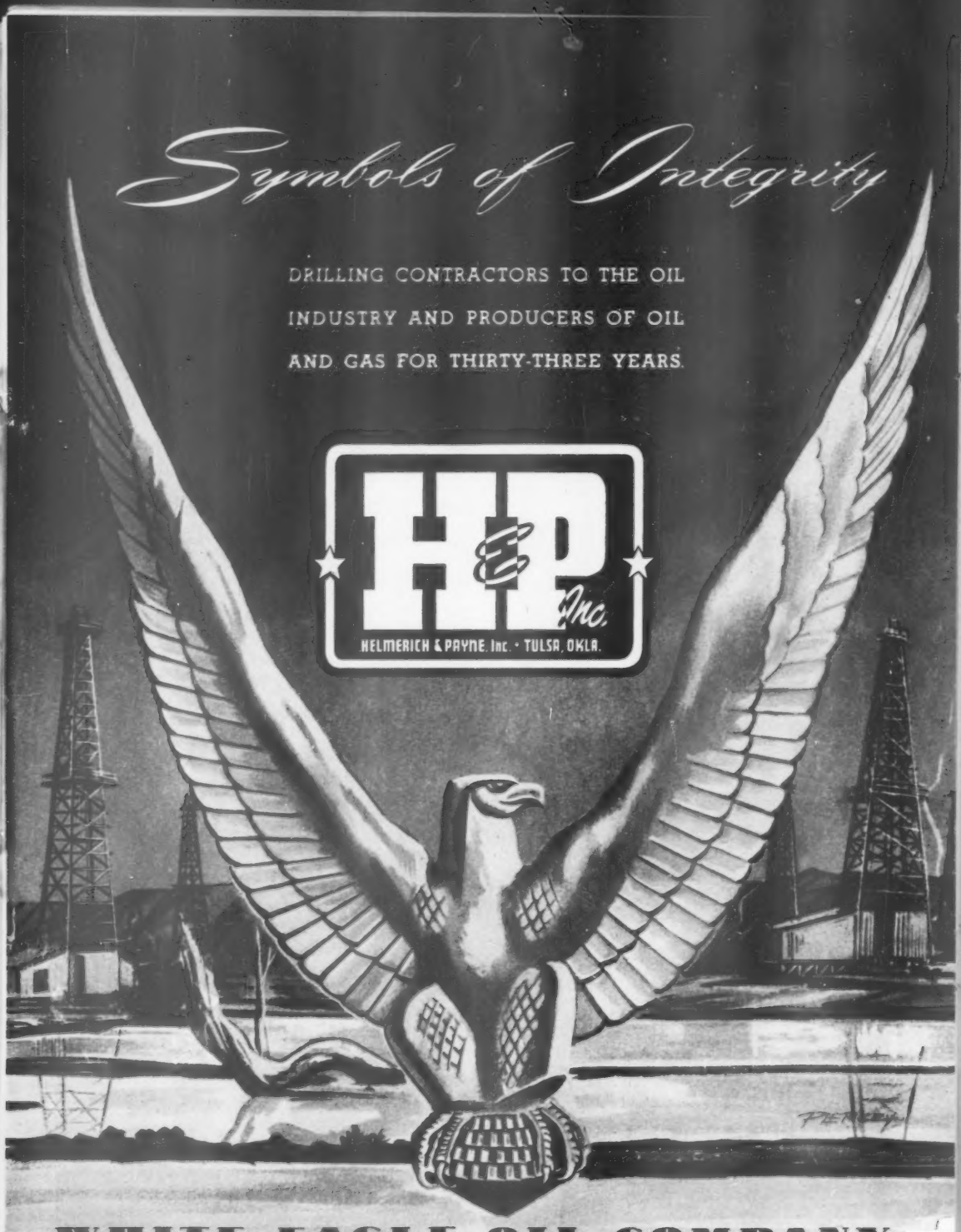
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Porosity Traps in Far West Kansas

RECENT oil and gas-distillate discoveries in pre-Permian rocks of far western Kansas and the adjoining part of the Oklahoma Panhandle have resulted in an active and accelerating interest in the area's potentialities. What has been the thinking that led to those discoveries and will lead to more?

Western Kansas is primarily a limestone (calcitic and dolomitic) area. The section is essentially limestone from the base of the Permian red beds to the basement rocks. The Pennsylvanian (Wabaunsee, Shawnee, Lansing-Kansas City, Marmaton, Cherokee, and Morrow), the Mississippian (Chester, Meramec, Osage, and Kinderhook), the Ordovician (Viola and Simpson), and the Cambro-Ordovician (Arbuckle) are all predominantly limestones in this area.

The thinking behind finding oil in this northern extension of the Anadarko basin must vary radically from that in areas where sand on structure offers the most promising trap. Thinking here must be in terms of porosity development.

This area offers two possibilities for porosity traps: (1) Those developed by solution at erosional surfaces. (2) Those in which porosity existed when the rocks were formed.

The beveled edges of Mississippian rocks extend across this area with successively older rocks exposed in the subcrop, updip to the north. Excellent porosity must have been formed by solution during the long erosional period that was required to bevel these rocks. Add some dense impermeable limestone streaks or topographic highs on the Mississippian surface and you have potential traps for oil.

Porosity traps of a different kind can be expected in Pennsylvanian rocks. These limestones are thick but not massive. They are made up of many members separated by minor unconfirmities. Porosity may have been developed by solution where these unconformities existed, but it cannot be expected to be comparable with the porosity developed during the long erosional period to which Mississippian rocks were subjected.

The principal type of porosity that can be expected in the Pennsylvanian rocks is in limestone "sands." Clastic material derived from limestone outcrops that is sorted and deposited along a beach becomes just as much a sand as if it were composed of quartz grains; and, consolidated limestone sands have porosity comparable to ordinary sandstone. In fluctuating seas it could be expected that these limestone sands were deposited like shingles, just as it has been demonstrated that siliceous sandstones were. Furthermore, they would trend around topographic highs just as quartz sand beaches do. It is conceivable that limestone sand dunes and offshore bars could be present in the area. Coral reefs cannot be ruled out. Reefs, like limestone sands, have initial porosity that requires no weathering to develop.

Wildcatting in this area has been based on regional studies only, yet the success ratio has been high. It would be strange indeed if this success ratio were just a matter of lucky coincidence. The success of this "scientific random drilling" can be interpreted only as indicating that porosity traps are not uncommon here—that they can be expected when sufficient section is cut.

Pennsylvanian and Mississippian discoveries have been made from the Oklahoma Panhandle to northwestern Kansas. This proof that the theoretically expectable porosity exists and carries oil and gas is most encouraging. Large areas remain untested below the top of the Pennsylvanian rocks. Hugoton, with its Permian-trapped dry gas, cannot be overlooked as a possible indication of tremendous oil deposits somewhere in deeper rocks. Though no big pools have been proven in this area to date, there are increasing indications that big oil may be just around the bend of some Pennsylvanian or Mississippian island.

Philip C. Ingalls

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

NEBRASKA . . . Ohio Oil Co. recovered 2,170 ft. of clean oil and 300 ft. of oil and gas-cut mud on drill-stem test of a 17-ft. "D" sand interval at 1 Beyer, SW SE SW 9-14n-50w, for a new Denver-Julesburg basin discovery southwest of East Brownson pool in Cheyenne County.

NORTH DAKOTA . . . Amerada Petroleum Corp. 1 North Dakota "D," important Charlson area wildcat in McKenzie County, is increasing in oil production after initial tests showed indications of a small Madison producer. The well flowed 155 bbl. of oil with 105 of water in 17 hours on latest gage.

ALBERTA . . . Amerada Petroleum Corp. announced that 1 Sturgeon Lake, rank wildcat in northwestern Alberta, had made several flows on frequent drill-stem tests in the D3 Devonian reef from 8,915-9,015 ft. and revealed 90 ft. of porous and well saturated pay section. The well is 200 miles northwest of the Edmonton reef area.

WEST TEXAS . . . In Andrews County, The Texas Co. 1-Z University was ready for completion as a Devonian discovery. After rig was moved the well was opened to flow 351 bbl. of oil in 21 hours through 30/64-in. tubing choke from perforations between 12,530-590 ft. Gulf Oil Corp. 1 Northrup, Delaware basin wildcat 24 miles southeast of Pecos, topped a sand at 12,240 ft. and started kicking mud at 12,250 ft.

California

Horse Meadows Discovery Nears Completion

LOS ANGELES.—Union Oil Co. was preparing to complete its 2-47 Horse Meadows as a new field discovery about 1½ miles south of Aliso Canyon production in Los Angeles County. Located in SE NE 4-2n-16w, the wildcat was drilled to 6,696 ft. but was plugged back to 4,669 ft. and 55 ft. of perforated liner landed at 4,610 ft. Union has staked 1-65 Horse Meadows as a southeast offset in Section 3.

Richfield Oil Corp. completed its gas test 2 miles southeast of Marysville-Buttes production in Sutter County. The wildcat, 1-A Sutter Community in 8-15n-2e, was drilled to 3,104 ft. and then plugged back to 2,150 ft. for completion. Tested on various beans the discovery flowed at rates of 6,700 to 9,000 M.c.f. daily from 2,065-2,145 ft.

Rapid evaluation of Superior Oil Co.'s new Pliocene sand discovery at Lost Hills, in Kern County, was in the making. Superior immediately started 2 Lost Hills as a north offset and Universal Consolidated Oil Co. has staked location for a south offset, its 101 "Well," Tide Water Associated Oil Co. has extensive holdings to the west and will undoubtedly enter the play. Richfield Oil Corp. has properties to the northwest.

Located about ¼ mile beyond dry holes which apparently defined existing Lost Hills production on the east, Superior 1 Lost Hills has been flowing about 125 bbl. daily through a 9/64-in. bean. Production was through perforations at 2,886-2,967 ft. in what is believed to be a new Pliocene sand for the area. Site of the successful test is in SW SW NW 18-26s-21e.

In the southeast end of San Joaquin Valley, interest continued to center around Eocene developments at Wheeler Ridge. There Richfield had run 7-in. casing in its 76-29 Kern County Land, a 1,000-ft. southwest stepout to the discovery. Drilled to 10,202 ft., top of the Eocene has been placed at about 10,065 ft. or about 180 ft. lower than in the discovery. Of the four other Eocene or Miocene tests under way in 27 and 28-11n-20w, deepest was at about 6,500 ft.

At San Emidio Ranch 12 miles west, where Richfield last July completed 18-21 San Emidio as a 450 bbl. flowing well in the Pliocene, the company has prepared location for two offsets. No. 78-20 C.C.M.O. has been staked one location west of the discovery and 81-29 San Emidio as a southwest offset. Both will seek production found at 7,227-80 ft. in the discovery.

General Petroleum Corp. is scheduled to soon start a deep wildcat about 7 miles northeast of the Eocene discovery at Wheeler Ridge, possibly carrying the test to below 15,000 ft. in search of Eocene production. The wildcat will be drilled in 32-12n-19w, or about 1½ miles east of a 15,092-ft. test drilled by Western Gulf Oil Co. in 1947.

A development in the Coastal California region was the abandonment of a wildcat 2 miles east of the San Ardo field in Monterey County. Standard of California D-6-3 Alexander, in 3-23s-11e, found the Lombardi wet at 2,670 ft., topped the basement at 2,928 ft., and was abandoned at 2,938 ft.

CALIFORNIA SUCCESSFUL WILDCATS

Fresno County, new Eocene condensate discovery in Turk anticline area: Richfield Oil Corp. 1 Denlinger, SW NE 14-17s-15e, flowed 400 bbl. per day through perforations at 9,219-9,331 ft., 59° gravity, 25/64-in. bean, 6,300 M.c.f., TD 9,970 ft. elev. 356 ft.

Kern County, Pliocene sand discovery in Lost Hills field: Superior Oil Co. 1 Lost Hills-Government, SW NW 36-28s-27e, flowed 133 bbl. per day through perforations at 2,886-2,967 ft., 20.3° gravity, 9/64-in. bean, TD 2,971 ft., elev. 385 ft.

Santa Barbara County, north extension to Cat Canyon field: M. J. M. & M. Oil Co. 23 Delaney-Tunnell, SW NW 23-9n-33w, pumped 300 bbl. per day from basal Sisquoc sand and fractured chart zone at 4,951-4,695 and 5,159-6,325 ft., 12.5° gravity TD 6,325 ft., elev. 770 ft.

Ventura County, new field discovery in Oakridge area: Union Oil Co. 2-10 Oakridge, 10-3n-18w, flowed 304 bbl. per day from perforations at 2,852-3,298 ft., 20.9° gravity 8 per cent cut, TD 3,300 ft.

CALIFORNIA WILDCAT FAILURES

Humboldt County, Hydesville Nose area: The Texas Co. 1 Holmes-Eureka (NCT-2), 9-2n-1e, dry, TD 6,110 ft., elev. 536 ft.

Kern County, Antelope Hills area: Enterprise Oil Co. 2 Enterprise, 8-27s-20e, dry, TD 1,845 ft., elev. 862 ft.

Salt Creek area: Beloil Corp., Ltd., 1 Bacon Hills, 12-29s-20e, dry, TD 3,682 ft.

Tejon Hills area: E. Nepple 1 Empire, 18-11n-17w, dry, TD 1,608 ft., elev. 1,510 ft.

Los Angeles County, Oak Canyon area: Ohio Oil Co. 1 Douglas, 4-4n-17w, dry, TD 10,503 ft., elev. 1,450 ft.

Santa Barbara County, Gato Ridge area: Ridge Hill Oil Co. 1 Magenheimer, 8-8n-32w, dry, Miocene 2,852 ft., TD 3,900 ft., elev. 1,180 ft.

Goleta area: Amerada Petroleum Corp. 1 Perry, 18-4n-28w, dry, TD 3,603 ft., elev. 27 ft.

Santa Maria Valley area: General Petroleum Corp. 88-32 Bradley Lands, 32-10n-33w, dry, TD 4,735 ft., elev. 421 ft.

Sutter County, Wild Goose area: H. H. Magee, Oper. 1 Field & Tule, 31-17n-1e, dry, TD 3,452 ft., elev. 55 ft.

Eastern Texas

New Wildcats Slated In Eastern Texas

DALLAS.—A number of new exploration tests were announced last week, including Gulf Oil Corp. 1 S. W. Lollar, 15,000-ft. project in the John Wilson Survey, A-911, described as the Cream Level Creek in Martin Mills area, Van Zandt County.

Trans-Tex Drilling Co. has announced location for 1 Mattie Melvin, 6,000-ft. wildcat 4 miles south of Jacksonville, in the H. S. Oliphant Survey. Drilling was to start as soon as permit was okayed.

Kaufman County gained two new operations. E. B. Fletcher will drill 1 C. J. Fogelman to the Woodbine around 4,200 ft., 2 miles southeast of Kemp, in the Ezekial Higdon Survey.

Humble Oil & Refining Co. has scheduled another Trvais Peak try 4 miles north of Elma in the northeast section of the county. The test will be 2 Roy Moody in the George Hider Survey, about ½ mile southwest of Humble 1 Moody, drilled dry to 7,473 ft. Contract depth on the new well was 7,000 ft.

Humble will drill 1 Trawick Gas unit 25 in Trawick field of Nacogdoches County, approximately 1 mile southeast of the Trawick Gas Unit 19. Location is on a 681-acre lease in the Luis Sanches and J. A. Caro Surveys.

Cities Production Co. has staked location for 2-C Wright, 1½ miles southwest of Crow in the Jose M. Garcia Survey, Smith County. Projected depth was 6,000 ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Bowie County: Watburn Oil Co. 1 Vickers, Samuel McKee Sur., 3 miles N Dalby Springs, dry, TD 4,536 ft.

Denton County: Harry Kithas 1 Aaron Phillips, H. Estis Sur., A-389, 4 miles W Pilot Point, dry, TD 1,602 ft.

Hill County: R. J. McMurrey 1 Joe Janek, Tyler CSL 3 mi. E Penelope, dry, TD 1,250 ft.

Hunt County: R. L. Peveto 1 Lemay Gibson, David Henson Sur., A-421, 1 mi. S Commerce, dry, TD 3,101 ft.

Leon County: Magnolia Petroleum Co. 1-A Swift Est., Ramon de la Garza Grant, 1 mi. W Kickapoo, dry, TD 7,601 ft.

Navarro County: T. M. Evans 1 T. Meredith, Samuel Benton Sur., A-44, 6 miles SE Dawson, dry, TD 2,175 ft., elev. 450 ft., Woodbine 1,930 ft.

Mississippi

New Wilcox Strike Finaled In Adams

JACKSON.—A new Wilcox discovery has been completed in Adams County, Mississippi at the John S. Callon 1 James W. Vaught, Sec. 1-5n-1w, located approximately 3 miles northeast of Pellucid Bayou field. Completion was from perforations 6,588-90 ft. opposite the Wilcox zone that produces at Pellucid Bayou. Log indicated 7 ft. of net effective sand in this zone which was topped at 6,587 ft. On completion test this discovery well flowed 164 bbl. of 40.8°-gravity oil per day through 10/64-in. choke with tubing pressure 370 psi. and casing pressure 520 psi. A name for this new producing area has not been designated.

In Pearl River County, Mississippi, the Gulf Refining Co. 1 U.S.A. "W," Sec. 8-1s-14w, encountered a drilling break at 9,469 ft. in the Lower Cretaceous. Samples were circulated out at 9,471 ft. and a show of oil was detected. A core was then cut 9,471-76 ft. with recovery being 2 in. of grey, hard, slightly porous sand with good fluorescence and oil stain. A 20-minute drill-stem test was then run 9,469-76 ft. using ¼-in. top and bottom chokes and 1,470 ft. of water cushion. Recovery from the test was 1,170 ft. of water cushion, 120 ft. of salt water and 720 ft. of oil cut with fresh water. Since 300 ft. of the fresh water cushion was not recovered as such, it seems reasonable to assume that amount had cut the oil. This would make 420 ft. of net oil recovered. Gravity of oil was 34°. Bottom-hole pressure was only 800 psi. flowing, but was 3,875 psi. after being shut in for 10 minutes and was still rising.

In the Paleozoic area of northeastern Mississippi, the Union Production Co. 1 Watson, Sec. 31-15s-7e, located approximately 4 miles southeast of the Muldon field discovery well, has been shot with nitro and a drill-stem test has been run, but no detailed information has been released.

MISSISSIPPI SUCCESSFUL WILDCATS

Adams County: John S. Callon 1 James W. Vaught, 1-5n-1w, TD 6,813 ft., PP

164 bbl. of oil per day on 10/64-in. choke, 40.8°-gravity oil.

Pearl River County: Sun Oil Co. 1 Moody, 17-1s-17w, TD 9,139 ft., flowed 7,786 M.c.f. of gas plus 78 bbl. of oil per day, 3/8-in. choke.

MISSISSIPPI WILDCAT FAILURES

Adams County: B. Serio 1 L. S. Stanton, 11-6n-3w, dry, TD 6,300 ft.

Jones County: Kemp Drilling Co. 1 Allen Boutwell, 10-7n-11w, dry, TD 7,112 ft.

Monroe County: Union Producing Co. 1 Neal, 21-15s-6e, dry, TD 6,549 ft.

ALABAMA WILDCAT FAILURE

Monroe County: Humble Oil & Refining Co. 1 T. W. Moore et al, 20-6n-6e, dry, TD 5,504 ft.

Oklahoma

New Producer Confirms East Washington Field

ANOTHER good well, the second, is in the making for the deep East Washington field, 7 miles northwest of Purcell, McClain County, where Woodward & Co. and Mendota Oil Co. are testing multiple, potential pay zones encountered in the Bromide and lower Simpson section at their 1-A Follis, NE NE SW 11-7n-3w.

This prospective confirmation well, a 40-acre north offset to the discovery producer, 1 Connor, drilled by the same operators, and completed last April, flowed at an average rate of 25 bbl. of clean oil per hour for 5 hours through ½-in. choke from Joins sand, the deepest and first zone tested. Pay is in open hole at 10,084-120 ft. Later, testing Bromide sand, opposite which casing was perforated at 9,247-9,307 ft., it flowed 48 bbl. of oil per hour for 5 hours through the same choke. Tulip Creek sand at 9,586 ft., which also showed for good production on drill-stem tests, has not been tested.

The discovery well was completed in Bromide sand at 9,236-96 ft. but also showed for good production from the Tulip Creek and Joins sands. The above operators are drilling below 6,500 ft. in their third well, 1-B Follis, NE NW SW 14-7n-3w, ¾ mile southwest of the discovery producer.

Carter Oil Co. is getting its second confirmation well for the recently opened Greenough field in northwestern Beaver County, in the Panhandle. Its 2 Sid Sharp, C NE SE 31-6n-22eCM, a 40-acre location north of the discovery well (1 Sid Sharp), headed after swabbing load oil for 6 hours and flowed 20 bbl. of new oil in the first 30 minutes. The flow died but when swabbing was resumed the well made 318 bbl. of oil in the next 24 hours. Pay zone, in basal Oswego lime, is open at 5,805-36 ft. Discovery of the field, opened last February, already has been confirmed at an east offset to the discovery well. A southwest offset, the only other test drilled, failed.

Another Beaver County wildcat, Youngblood & Youngblood 1 Barby, C NW NW 28-6n-26eCM, located about 4 miles north of Pure Oil Co.'s recent gas-distillate discovery well (1 Albert) in the Knowles area in the northeast part of the county, has found encouraging oil and gas showings. It got 1,300 ft. of gas and 120 ft. of heavily oil and gas-cut salt water with 660 ft. of salt water in a 75-minute drill-stem test at 5,341-49 ft. In a 2-hour drill-stem test of a lower prospective pay zone at 5,551-63 ft., it got a gas blow in 83 minutes and recovered 90 ft. of heavily oil and gas-cut mud and 80 ft. of oil and gas-cut salt water. Both showings are being passed up for the time being.

Fullerton Oil Co. has a new Skinner sand discovery well in southwestern Payne County, where its 1 Nelson, NE SW NE 25-18n-2e, flowed at the rate of 10 bbl. of oil per hour through ½-in. choke. Pay is open through casing perforations at 4,153-55½ ft. Hole had been drilled to 4,796 ft. in second Wilcox sand, which carried water. Location is 2 miles north of Perkins and east of the Ramsey pool.

Zephyr Petroleum Co. has another Skinner sand discovery well at its 1 Todd, NW NW SE 26-17n-1e, about 10 miles southwest of the Fullerton well in western Logan County. The Zephyr well, drilled as a southeast offset to a recently completed second Wilcox sand discovery well (Sam Trant and John Kraker 1 Wilson), found the deeper zones dry. Testing the Skinner sand, opposite which casing was perforated at 4,556-67 ft., it flowed 13 bbl. of oil the first hour.

OKLAHOMA SUCCESSFUL WILDCATS

Lincoln County: Culbertson & Vandenover 1 Marty, NW NE SE 22-14n-4e, pumped 50 bbl. of oil from sandy dolomite 4,966-76 ft., TD 5,030 ft., PBTD 4,994 ft. (extends Chandler South pool).

Okmulgee County: W. S. Bogie 1 Bedleman, SW SW SW 10-13n-12e, pumped 16 bbl. of oil from Booch 1,797-1,815 ft., TD 1,815 ft. (new pay in Okmulgee district).

Payne County: Feagan Co. 1 Cudiff "A,"

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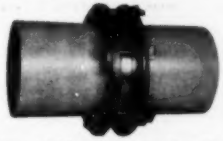
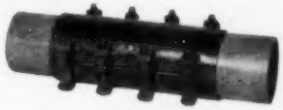
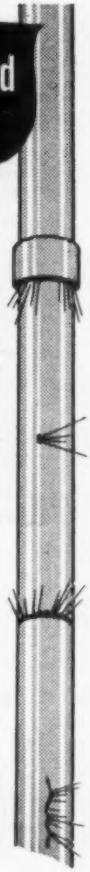


For repairing leaks in circumferential welds. *Porous Weld Clamp*, Style 55.



For repairing pitholes and longitudinal splits. *Split Repair Clamp*, Style 79B.



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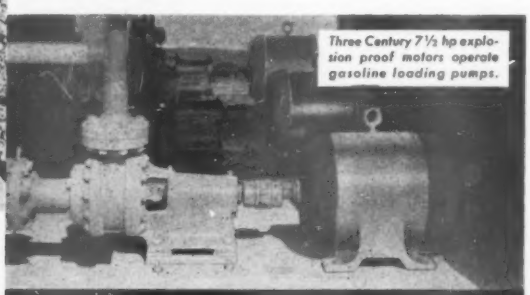

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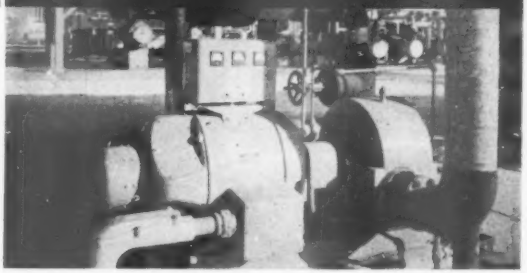

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NE NW SW 9-17n-1e, pumped 20 bbl. of oil from Wilcox 5,105-14 ft., TD 5,178 ft. (discovery).

OKLAHOMA WILDCAT FAILURES

Beaver County: Deep Rock Oil Corp. 1 Adams, C SE NW 22-6n-25ecm, dry, TD 6,670 ft.

Garfield County: J. M. Henry & Smith-Cleary 1 Euhl, SW NW SW 24-21n-3w, dry, TD 2,250 ft.

Hughes County: Barch Drilling Co. 1 Werner, C NW SE 17-8n-12e, dry, TD 2,213 ft.

Jefferson County: C. W. Van Eaton 1 Featherstone, SE SW SW 27-3s-5w, dry, TD 3,538 ft.

Lincoln County: K. A. Ellison 1 Tull, SE SE SW 26-13n-6e, dry, TD 4,274 ft.

Athens Petroleum Co. 1 Buetow, NE NE NE 10-15n-2e, dry, TD 5,278 ft.

Arthur Silberman 1 Murphy, NE SE SW 5-16n-2e, dry, TD 5,225 ft.

Love County: Texas Pacific Coal & Oil Co. 1 George Carlson, NW SW NW 13-6s-1e, dry, TD 4,010 ft.

Noble County: Kerr-McGee Oil Industries 1 Coon, SE NE NE 23-21n-3e, dry, TD 4,044 ft.

Summit Drilling Co. 1 Cottle, SW NW SE 8-21n-2w, dry, TD 1,944 ft.

Osage County: Hudson & Cowell 1 Osage, NW NW SE 30-26n-8e, dry, TD 2,891 ft.

Pontotoc County: Kingery Bros. 1 Robbins, NE SE NW 7-3n-6e, dry, TD 2,710 ft.

Lee Elyott 1 Hobbs, SE SE NW 1-4n-6e, dry, TD 2,085 ft.

Pottawatomie County: Sun Oil Co. 1 Doctor, SW NW SE 6-8n-2e, dry, TD 6,114 ft.

Texas County: Unit Drilling Co. 1 Collins, NE NE NE 22-2n-10ecm, dry, TD 5,797 ft.

North-Central Texas

Northeast Extension Seen For Big Mineral Creek

WICHITA FALLS.—Big Mineral Creek field of Grayson County had prospects of a 1-mile northeast extension at Cox Drilling Co. 1 Bailey-Talley Unit. Drill-stem test at 5,295-5,305 ft. developed some free oil and oil-cut mud, and at 5,304-14 ft. recovery in 30 minutes was 305 ft. of 30°-graviyt oil, plus 100 ft. of oil-cut mud.

Operators drilled ahead and tested for 1 hour from 5,707-18 ft., which produced a light blow for 15 minutes and recovered 10 ft. of mud. A drill-stem test was under way at 5,727-35 ft.

Mid-Continent Petroleum Corp. 1 George Buchanan, east of Knox City, extended conglomerate pay one location west of Deep Rock Oil Corp. 1 Hawkins, discovery well in the conglomerate. Mid-Continent's well recovered 1,130 ft. of free oil and 120 ft. of mud-cut oil on a 1½-hour drill-stem test from 5,782-5,809 ft. Operators were drilling ahead.

Magnolia Petroleum Co. staked location for 1 C. McCall, 3½ miles east of Montague and a southeast offset to Wrather Petroleum Corp. 1 Meador (see completions), two-way discovery. Contract depth was 7,000 ft.

Tom Medders 1 Whitaker, northwest Wise County wildcat, had prospects of extending Bend conglomerate production 2 miles south of a recent discovery. First test from 5,754-63 ft. recovered gas and gas-cut mud. Second test from 5,772-82 ft. flowed gas at the rate of 2,000,000 cu. ft. daily and recovered 35 ft. of oil plus 40 ft. of heavily oil-cut mud.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Clay County: S. D. Johnson 1 L. T. Burns, J. Robbins Sur., A-394, TD 4,034 ft., Strawn sand pay 4,028 ft., IP 114.6 bbl. 43°-gravity oil, 10/64-in. choke, TP 225 psi., GOR 365 cu. ft.

Coleman County: Bells Wells Oil Co. 1 T. J. Hudson, Georgetown RR Sur. 47, TD 3,639 ft., elev. 1,840 ft., pay 3,506-13 ft., IP pumped 95 bbl. 38°-gravity oil, GOR 350 cu. ft.

Ben Donegan 1 S. N. Payne, Blk 2, G. W. Morgan Sur. 390, TD 3,521 ft., elev. 2,022 ft., pay 3,389 ft., IP 552 bbl. 44°-gravity oil, 24/64-in. choke, TP 330 psi., GOR 660 cu. ft.

L. H. Choate and Bankline Oil Co. 1-26 Mrs. J. Ballard, 1-26-J. F. Gordon Sur., TD 3,094 ft., elev. 1,794 ft., pay 2,443 ft., IP 56 bbl. 40°-gravity oil, 14/64-in. choke, TP 550 psi., GOR 1,200 cu. ft.

North Exploration Co. 1 A. E. Watson, Sec. 57, Coleman CSL, TD 2,131 ft., elev. 1,736 ft., pay 2,126 ft., IP pumped 52 bbl. 44°-gravity oil.

Fisher County: Texas Pacific Coal & Oil Co. 1 Eva Lenna Johnson, 196-1-BBB&C, TD 6,375 ft., elev. 1,784 ft., pay 5,136 ft., IP 163 bbl. 42°-gravity oil, 24/64-in. choke, TP 170 psi., GOR 1,391 cu. ft.

Jack County: Henry Grace 1 Effie Edwards, J. B. Downing Sur., A-2,010, TD 3,336 ft., pay 3,321 ft., IP pumped 117 bbl. 44°-gravity oil.

J. L. McMahon Jr. 8-A Roney, Sec. 3,327, TE&L, TD 414 ft., pay 403 ft., IP pumped 5.29 bbl. 39°-gravity oil.

T. A. & M. Oil Co. 1 Johnson Bros., BS&F Sur., A-2,390, TD 4,620 ft., pay 4,515 ft., IP 112 bbl. 42°-gravity oil, 16/64-in. choke, TP 200 psi., GOR 800 cu. ft.

Montague County: Benbrook Oil Co. 1 R. L. Pierce, ETRR Sur. 19, A-237, TD 5,734 ft., elev. 1,050 ft., conglomerate pay 5,654 ft., IP pumped 17 bbl. 40°-gravity oil.

Jack Grace Production Co. 1 J. W. Bussey, Blk. 82, M. Garnett Sur., TD 5,635 ft., conglomerate pay 5,610 ft., IP 205 bbl. 44°-gravity oil in 4 hours, TP 350 psi., GOR 575 cu. ft.

Russell Maguire 1 Whitehead, W. Bond Sur., A-59, TD 7,209 ft., pay 5,804 ft., IP 51 bbl. 42°-gravity oil, TP 275 psi., GOR 1,200 cu. ft.

Transwestern Oil & Gas Corp. et al 1 J. M. McFall, A. Ritchie Sur., A-1,556, TD 6,020 ft., pay 5,928 ft., IP 1,474,000 cu. ft. of gas, plus 112 bbl. distillate, 16/64-in. choke, TP 1,380 psi.

Wrather Petroleum Corp. 1 C. D. Meador, 25-12-Calhoun CSL, TD 7,071 ft., top Jaydee conglomerate pay 7,010 ft., IP 587 bbl. 41°-gravity oil, 20/64-in. choke, CP 750 psi., GOR 750 cu. ft., perf. Jaydee Strawn 6,649-59 ft., IP 341.5 bbl. oil, ¾-in. choke, TP 150 psi.

Shackelford County: G. M. Neff 1 I. M. Chism, Sec. 6, BAL Sur., TD 277 ft., pay 261 ft., IP pumped 7.4 bbl. 33°-gravity oil.

Neff 3 I. M. Chism, Sec. 6, BAL Sur., TD 268 ft., IP pumped 7.4 bbl. oil.

Pitzer & Sons 1 F. G. Coates, 30-13-T&P, TD 1,649 ft., pay 1,640 ft., IP pumped 45 bbl. 36°-gravity oil.

Throckmorton County: N. R. Roberts 1 Ewalt, Sec. 2,321, TE&L Sur., TD 4,065 ft., elev. 1,217 ft., Caddo 4,040 ft., IP 34 bbl. oil, ¼-in. choke, TP 60 psi.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: C. U. Bay 1 W. V. Weinzapfel, 116-4-Clark & Plumb, dry, TD 4,012 ft.

Fortex Oil Co. 1-C Turbiville, Blk. 63, Jefferson CSL, dry, TD 1,119 ft.

North Texas Supply Co. et al 1 Carpenter, Lot 89, Blk. 4, Clark & Plumb, dry, TD 1,138 ft.

Perkins-Protho 2 J. J. Perkins, Blk. 1,888, TE&L, dry, TD 993 ft.

Baylor County: Wichita Pipe & Supply Co. 1 Kulhancek Lease, 331-A537-BBB&C, dry, TD 1,656 ft.

Brown County: J. T. Paulsel 1 George Pugh Land, C. B. Jennings Sur. 353, dry, TD 1,240 ft.

Clinton E. Smith 1 Mrs. W. C. Ferguson, 15-A464-HT&B, dry, TD 1,626 ft.

I. M. White and James C. Walker 1 L. W. Boyd, Sec. 107, Thos. Pratt Sur., dry, TD 1,350 ft.

Clay County: Hassie Hunt Trust B-2 Tom Watson, W. A. Farris Sur., A-148, dry, TD 3,930 ft.

Coleman County: Don L. Choate and Bankline Oil Co. 2 Ballard, 25-2-GH&H, dry, TD 2,506 ft.

Cooke County: Kimbell-Sims 1 Hollandsworth, Blk. 24, Fannin CSL, A-1,248, dry, TD 4,023 ft.

Eastland County: J. R. Dockery 1 Johnnie Aaron, 4-3-H&TC, dry, TD 3,601 ft.

Erath County: G. M. O'Dell 1 Bill Hoherts, Bartlett Fry Sur., dry, TD 3,920 ft., elev. 1,280 ft., Marble Falls 3,803 ft.

Grayson County: J. R. and Adams Seitz 1 K. J. Haining, J. Williams Sur., A-1,302, dry, TD 5,740 ft. in the Ellenburger.

Haskell County: The Chicago Corp. 1 R. L. Burton, Wm. Walker Sur., A-412, dry, TD 5,496 ft., elev. 1,555 ft., Palo Pinto 3,875 ft., Caddo 5,312 ft.

Jack County: M. E. Andrews 1 Dodson Est., Geo. W. Still Sur., A-529, dry, TD 5,374 ft.

S. D. Johnson 1 M. Clerihews, Blk. 35, M. Putnam Sur., A-465, dry, TD 4,001 ft.

Jones County: Creslenn Oil Co. 1 N. Rutledge, Blk. 9, F. Sieberman Sur., dry, TD 2,320 ft., Swastika 2,125 ft.

S. C. Herring Drilling Co. 1 Nedecken, 339-28-Austin & Williams Sur., dry, TD 3,250 ft.

Slick-Moorman Oil Co. 1 A. B. Cranston Est., 18-17-T&P, dry, TD 2,930 ft.

Montague County: Bolin Oil Co. 1 A. L. Redd, Blk. 20, J. Y. Castillo Sur., dry, TD 5,637 ft., Caddo 5,390 ft.

Palo Pinto County: Deep Rock Oil Co. 1-A Gafford-Branson, Blk. 6, Geo. Freighen Sur., dry, TD 5,300 ft.

Parker County: Roeco Oil Co. 1 B. E. Thomas, Wm. Haynie Sur., A-581, dry, TD 3,868 ft., elev. 869 ft., Strawn 2,335 Caddo 3,738 ft.

Stephens County: Bond Oil Co. 2 P.W. Pitzer, 16-4-T&P, dry, TD 3,900 ft., elev. 1,115 ft., Caddo 3,265 ft.

G. D. Chastain 2 Mrs. R. E. Basher, Sec. 463, SPRR Sur., dry, TD 4,135 ft.

Stonewall County: Continental Oil Co. 1 T. H. Ward, 396-D-H&TC, dry, TD 5,307 ft.

Taylor County: West Central Drilling Co. 1 B. S. Dance, Sec. 128, Jose Gabo Sur., dry, TD 3,456 ft.

Throckmorton County: Texoma Drilling Co. 1 Christian McKeichen, E. E. Hall Sur., A-216, dry, TD 930 ft.

Young County: Buckalew-Norman 1 A. E. Klenk, Blk. 174, TE&L Sur., dry, TD 1,175 ft.

Buckalew-Norman 2 Klenk, Blk. 174, TE&L, dry, TD 1,172 ft.

Buckalew-Norman 3 Klenk, Blk. 174, TE&L, dry, TD 1,175 ft.

Buckalew-Norman 1-A Klenk, Blk. 174, TE&L, dry, TD 1,189 ft.

Morris & McCutchen 1 J. W. Daws, TE&L

Sur. 1,679, dry, TD 4,410 ft., elev. 1,228 ft., Strawn 2,871 ft., second Strawn 2,961 ft.

Permian Basin

Delaware Wildcat Tops Unidentified Sand

MIDLAND.—Gulf Oil Corp. 1 Northrup, Delaware basin wildcat 24 miles southeast of Pecos, topped a sand at 12,240 ft. and started kicking mud at 12,250 ft. The formation had not been identified, and the gas cap was thought to be relatively small. Operators pulled drill pipe to 8,350 ft. where it started kicking against 12-lb. mud. The hole was reentered with 14-lb. mud but hit a bridge at 8,890 ft., where it was shut down to install well-head pressure equipment as a precaution in drilling ahead.

Signal Oil and Gas Co. 1 J. G. Webb, Yoakum County wildcat 3 miles west of Plains, topped the Wolfcamp at 8,920 ft., then cored fine-grained limestone with scattered porosity and oil stains to 8,955 ft. Drill-stem test between 8,853-55 ft., open 2 hours and 45 minutes, developed 285 ft. of mud that was about half oil; 180 ft. of oil-cut mud and 90 ft. of slightly oil and gas-cut mud. A second test from 8,955-90 ft., open 2 hours, developed 425 ft. of slightly gas-cut drilling mud. It was drilling ahead at 9,063 ft.

Ryan, Hayes & Burke 1 Fillingham, 10 miles southwest of Plains, recovered 30 ft. of oil and gas-cut mud from 5,210-70 ft. It was drilled ahead to 5,405 ft. for another test.

In Presidio County, Gulf Oil Corp. 1 Mitchell Bros. was drilling sandy shale at 13,364 ft. with no shows reported. Projected depth was 14,000 ft.

In Andrews County, The Texas Co. 1-Z University was ready for completion as a Devonian discovery. After rig was moved, the well was opened to flow 351 bbl. of oil in 21 hours through 30/64-in. tubing choke, from perforations between 12,530-90 ft.

Phillips Petroleum Co. got a second big Ellenburger well in Block 12-Ellenburger field of Andrews County, offsetting its recent discovery in Section 17. The 2 University "EE" flowed 1,103 bbl. of 44°-gravity oil a day through ½-in. choke on potential test. Total depth was 10,962 ft., with top of pay at 10,916 ft. on elevation of 3,293 ft.

Phillips 1-CS University, Andrews County, Devonian prospect, was drilling below 12,665 ft. after recovering 180 ft. of oil-cut mud from 12,591-641 ft.

Magnolia Petroleum Co. 1-P TXL, 9-41-T5S-T&P, completed as an Ellenburger well and has been assigned to Pegasus field. Completion potential, was 289.6 bbl. of high-gravity oil. Top of the Ellenburger was 13,088 ft. Location of the well is 3½ miles southwest of nearest production in Pegasus field, and about 2 miles north of the Davis area which has production in the Ellenburger and the Spraberry.

Magnolia 1-T TXL, northwest extension try to Davis field was coring sand and shale at 8,223 ft.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Sterling County: Tex Harvey Oil Co. 1 J. E. Chappel, 43-18-SPRR, TD 7,761 ft., elev. 2,286 ft., pay 7,674 ft., IP 99 bbl. 46°-gravity oil, 36/64-in. choke, TP 175 psi., GOR 1,600 cu. ft.

Terry County: Jake L. Hamon (formerly Coroco Drilling Co.), 1 Atlas Life, 93-D11-C&M, TD 13,245 ft., elev. 3,457 ft., PB 8,444 ft., dolomite pay 8,304 ft., IP pumped 308 bbl. 28°-gravity oil.

Tom Green County: L. E. Scherek 1 Tom Nasworthy, H. Zerbach Sur. 178, TD 6,406 ft., elev. 1,921 ft., pay 5,916 ft., IP pumped 75 bbl. 34°-gravity oil.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Andrews County: Ralph Lowe 1 Home Stake, 3-A34-PSL, dry, TD 12,397 ft., elev. 3,227 ft., Mississippian 11,625 ft., Woodford 12,225 ft., Devonian 12,292 ft.

Borden County: Ashmun & Hilliard 1-C Long, 7-30-T4N-T&P, dry, TD 8,174 ft., elev. estimated 2,569 ft., Spraberry 5,308 ft., Dean 6,776 ft., Pennsylvanian 8,070 ft.

Dawson County: Cities Service Oil Co. 14 Dupree, 67-M-EL&RR, dry, TD 12,400 ft., elev. estimated 3,093 ft., Spraberry 7,586 ft., Pennsylvanian 9,566 ft., Ellenburger 12,365 ft.

Ector County: Forest Oil Corp. 1 Continental-Wight, 6-43-T1S-T&P, dry, TD 7,257 ft., elev. 3,123 ft., Glorietta 5,155 ft., Clear Fork 5,470 ft., Tubb 5,945 ft.

Gaines County: Reno Oil Co. 1 Barton, 134-G-WTRR, dry, TD 5,700 ft., elev. 3,296 ft., Yoakum dolomite 4,610 ft., Grayburg 4,870 ft., San Andres 5,250 ft.

Howard County: Stanolind Oil & Gas Co. 1 Modesta Simpson, 21-22-T3N-T&P, dry, TD 8,990 ft., elev. 2,783 ft., Dean 7,960 ft., Pennsylvanian reef 8,905 ft.

Midland County: Union Oil Co. of California 1 T. Elkin, 33-38-T1S-T&P, dry, TD 12,650 ft., elev. 2,790 ft., Spraberry 7,698 ft., Devonian 11,571 ft., Simpson 12,400 ft., Ellenburger 12,545 ft.

Pecos County: Chas. A. McCamey 1 State National Bank, 31-140-T&STLRR, dry,

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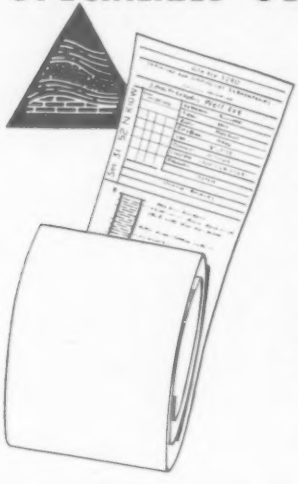

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TD 7,010 ft., elev. 2,526 ft., Simpson 5,280 ft., Ellenburger 6,910 ft.

Presidio County: Lewis W. Welch 1 Joe Espy, 110-4-H&TC, dry, TD 7,837 ft., in pre-Cambrian, elev. 4,746 ft.

Runnels County: Richard King and Delaware Drillers 1 Mrs. E. M. Michaelis, Sec. 530, Absalon Jett Sur., dry, TD 4,100 ft., elev. 1,741 ft., Swastika 2,595 ft., Gardner 4,011 ft.

Sojourner Drilling Co. 1 Mrs. W. J. Fowler, ETRR Sur. 150, dry, TD 4,155 ft.

Schleicher County: Carter & Carter 1 M. L. Jackson, 6-A-HE&WT, dry, TD 7,015 ft., elev. 2,392 ft., Eilenburger 6,800 ft.

Tom Green County: H. Bryan Poff and Brinsmere 1 Will C. Jones, 38-24-H&TC, dry, TD 5,517 ft., elev. 3,235 ft., Palo Pinto 4,562 ft., Strawn 5,350 ft.

Upton County: E. Constantin Jr. 1 W. R. Morgan, 24-B-CCSD&RGNG, dry, TD 7,338 ft.

Texas Pacific Coal & Oil Co. 1-A Neal, 32-B-C&M, dry, TD 12,460 ft., elev. 2,620 ft., Spraberry 6,806 ft., Dean 8,098 ft., Fusselman 11,842 ft., Ellenburger 12,380 ft.

TEXAS PANHANDLE (DISTRICT 10) SUCCESSFUL WILDCAT

Hutchinson County: The Texas Co. 1 Holt, 52-5T-T&NO, 11 miles W, 2 miles S of NE corner of county, TD 7,907 ft., gas pay 4,965-78, 6,002-16, 6,022-27 ft., IP 10,940,000 cu. ft. RP 1,400 psi.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURES

Hartley County: Texas Gulf Producing Co. 1 Matador, 53-22-CS, 16 miles SW Channing, dry, TD 4,802 ft., elev. 3,703 ft., Wichita 3,070 ft., pre-Cambrian 4,796 ft.

Swisher County: H. L. Hunt 1 Bivins, 124-M8-AB&M, 2 miles W Tulia, dry, TD 9,021 ft., elev. 3,532 ft., Wolfcamp 5,620 ft., Mississippian Strawn 7,830 ft., Mississippian 8,958 ft.

Wheeler County: Gulf Oil Corp. 1-A Redding, 29-A5-H&GN, 5 miles SW Mobeetie, strat test, dry, TD 4,476 ft.

SOUTHEAST NEW MEXICO

The Texas Co. 1-BK State, south extension to Tulk field in 5-15s-32e, prepared for completion attempt in the Wolfcamp. Pipe was being run to 9,760 ft. after a drill-stem test from 9,680-9,760 ft.

The Texas Co. 1 BQ State, north of Saunders pool developed 250 ft. of clean oil, plus 90 ft. of heavily oil and gas-cut mud on a 2-hour test at 9,980-10,000 ft. A 3-hour test at 10,030-54 ft., recovered 15 ft. of slightly gas-cut mud, with no oil.

New wildcat locations included British-American Oil Producing Co. 1 White Ranch, 8,000-ft. Chaves County wildcat in 9-10s-28e, and on a spread of 2,880 acres obtained from Magnolia and DeKalb Agricultural Association, Inc.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCATS

Lea County: Fullerton Oil Co. 4 Elliott-Federal A-1, 9-21s-38e, TD 4,382 ft., elev. 3,583 ft., San Andres 4,342 ft., IP pumped 41 bbl. 35°-gravity oil.

Horsting Oil Co. 1 Phillips-State, 20-17s-33e, TD 4,765 ft., elev. 4,176 ft., pay 4,170 ft., IP pumped 43 bbl. oil.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Lea County: Sinclair Oil & Gas Co. 1 Charlie Taylor, 14-16s-38e, dry, TD 11,040 ft., elev. 3,637 ft., Pennsylvanian 9,050 ft., Mississippian 9,920 ft., Devonian 10,910 ft.

San Miguel 1 McCune, 22-11n-13e, dry, TD 3,119 ft., pre-Cambrian 3,111 ft.

Southwest Texas

Production Confirmed In New Spartan Field

CORPUS CHRISTI.—Spartan Drilling Co. 1 Charles I. Lovett has confirmed production in the new Spartan field, in San Patricio County, 3 miles northeast of Odem. Production is from perforations in the Bullard sand. Perforations were made at 8,080-88 ft. and on a 16-hour test, well flowed 192.72 bbl. of pipe line oil, on a 10/64-in. choke, tubing pressure 1,450 psi., casing sealed. On 24-hour test, well flowed 302.22 bbl. of 36.7°-gravity oil per day, tubing pressure of 1,470 psi. The original wildcat discovery lies 1,080 ft. northeast of this well. Location is in the Welder and Odem Subdivision, Block 3-A.

Arnold C. Morgan B-1 J. B. Hardwicke, a wildcat, in San Patricio County, 2 miles north of Odem, is reported flowing gas-distillate for a new field discovery. Production was from the basal Frio section. Gage and further information concerning the completion is not available at this time. Well lies in the Pat Fitzsimmons Survey, Welder and Odem Subdivision, Block 41. Proposed drilling depth is 9,000 ft.

Richardson and Bass 1-265 State Tract is a gas-distillate discovery approximately 8 miles southeast of Rockport. The new producer was completed from perforations at 7,998-8,010 ft. (Frio). Completion was for an initial potential flow of 8,000,000 cu. ft. of gas per day on open flow. On 11/64-in. choke, well flowed 2,752,000 cu. ft. of gas per day. The distillate had a gravity of 52°, gas-oil ratio was 76,400:1. Tubing pressure was 2,265 psi. and shut-in pressure was 4,040 psi. Name of the new field is Blind Pass.

Phillips Petroleum Co. has set casing below 4,815 ft. at the A-1 Clara Driscoll estate and will test a sand encountered at 4,828-33 ft. On a 10-minute drill-stem test on the section 4,828-33 ft., using ¼-in. chokes, working pressure was 600 psi. and recovery was 2 ft. of gas-cut mud. Bottom-hole pressure was 1,775-2,065 psi. The hole is bottomed at 9,000 ft. and no shows of commercial importance was encountered in the deeper zones. Location is on the E. Villareal and W. S. McGregor Survey 582, 7.5 miles northwest of Corpus Christi.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Duval County: Barron Kidd 1 J. W. Phillips, 7 miles NE Bruni, TD 2,080 ft., IP 1,011,000 cu. ft. of gas per day on open flow.

Starr County: Jake L. Hamon 1 Margarita S. de Flores et al, Ancinet Jurisdiction of Reynosa Porcion 40, TD 6,500 ft., IP 33 bbl. of oil per day, 46.0°-gravity, gas-oil ratio 1,990:1.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Armstrong & Horn et al 1 A. Wehman, John W. Cook Sur., Sec. 1,626, dry, TD 1,776 ft.

Calvert, Cochran & Manley 1 E. B. Poth, F. M. Mansfield 4 Sur., dry, TD 2,173 ft.

Brooks County: Stanolind Oil & Gas Co. 1 Thos. M. Lasater, AB&M Sur. 289, A-42, dry, TD 8,020 ft.

Caldwell County: Frio Petroleum Co., Ltd., C. E. Starr et al 1 C. C. Crowell, Gerrel Hinds Sur., dry, TD 5,949 ft.

Frio County: Harvey Whitaker 1 Halff & Oppenheimer, W. F. Halsel 97, dry, TD 6,312 ft.

Gonzales County: Edward Lee Johnson et al 1 J. F. Robinson, L. Mallett Sur., dry, TD 2,452 ft.

LaSalle County: Sun Oil Co. 1 Naylor & Jones, Jacob Blanton Sur. 292, dry, TD 5,110 ft.

Webb County: G. G. Mortimer, Jr. et al, 1 R. E. Welhausen, 7 miles N Oilton, dry, TD 2,665 ft.

Williamson County: W. S. Shirley 1 W. B. Brewer, Peter Cartwright Sur., dry, TD 1,200 ft.

Wilson County: E. L. Elkins et al 1 Max Huckleman, C. W. Parrott Sur. 148, dry, TD 108 ft.

E. L. Elkins at al 1 Mary Johnson, J. Reneau Sur. 477, dry, TD 104 ft.

E. L. Elkiins et al 2 Mary R. Johnson, J. Reneau Sur. 477, dry, TD 110 ft.

H. H. Howell 1-A G. N. Evans, Wm. N. Kirk Sur. 77, dry, TD 4,618 ft.

Zapata County: Humble Oil & Refining Co. 1 Manuel Villareal, Anastacio Garcia 202, Charco Redondo Grant, dry, TD 3,006 ft.

South Louisiana

Flow Reported At Calcasieu Discovery

NEW ORLEANS.—A flow of 145 bbl. of 50.6°-gravity distillate plus 1,465,000 cu. ft. of gas daily through a ⅛-in. choke has been reported by Sun Oil Co. on the 5 Lutcher-Moore, Calcasieu Parish, discovery. Bottomed at 9,722 ft., with 7-in. casing cemented at 8,392 ft. with 2¾ in. tubing swung at 9,000 ft., well flowed through perforations from 9,015 to 9,030 ft. Tubing pressure of 4,450 psi. was registered, with gas-liquid ratio of 10,103:1. New discovery is located 6 miles northwest of Stark townsite in Section 2-8s-13w.

A flow of dry gas at the rate of 225,500 cu. ft. daily on a ⅛-in. choke is reported by Humble Oil & Refining Co. on the 1-D State Lease 819, wildcat in the West Delta area, Jefferson Parish. Well bottomed at 2,856 ft. with 5½ in. casing set at 2,703 ft. and 2⅜-in. tubing at 2,438 ft., flowed through perforations from 2,484-93 ft. under 750 psi. of tubing pressure.

Approximately 1½ miles northeast of Bordelonville townsite, Avoyelles Parish, Pan Am Southern Corp. has staked location for a 8,450-ft. confirmation test in Section 36-2n-5e. New venture, to be carried as the 1 T. P. Bordelon, proposes to confirm Bordelonville field production completed July, 1951.

The California Company is reported preparing to drill ahead at 11,444 ft. after setting 7-in. casing at 11,400 ft. on the 1 W. A. Jones unit, Lafourche Parish wildcat. Projected to 12,000 ft., venture is located in Section 3-17s-22e.

On a 4½-hour drill-stem test, Kerr & McGee reported a flow of 2,720,000 cu. ft. of gas daily on a 16/64-in. choke on the 1-C State Lease 2001, Plaquemines Parish. Well, bottomed at 6,899 ft. with 5-in. casing set at 6,846 ft., flowed through perforations at 4,887-4,893 ft. under 1,693 psi. working pressure. Previously, through a 14/64-in. choke the well flowed 2,190,000 cu. ft. of gas daily on a 1-hour test. Test is located in Block 36, Breton Sound.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Acadia Parish: Sunray Oil Corp. 1 Cyprien Fontenot, 80-8s-2e, TD 12,600 ft., IP 89 bbl. of oil per day, 8/64-in. choke,

Emptying waste crude from a sump with this 45-bbl. Thompson Unitized Vacuum Tank takes only minutes. (Note the sump wall still shiny-wet.) Only one man is needed to handle loading, transporting, and unloading. Compare this economy with slow, old-fashioned methods.

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1,300,000 cu. ft. of gas per day, 50.1° gravity.

Calcasieu Parish: Gulf Refining Co. 1 Martha De Rouen et al, 15-11s-6w, TD 11,590 ft., 59.8 bbl. of oil per day, 5,325,000 cu. ft. of gas per day, gas-oil ratio 89,000:1.

Lafourche Parish: Hassie Hunt Trust 1 Joseph Marcello, 59-15s-17e, TD 13,760 ft., IP 49 bbl. of oil per day, 2,525,000 cu. ft. of gas per day, 51.2° gravity.

Plaquemines Parish: Estate of Wm. Helis 1 St. Lse. 1762, TD 10,551 ft., flowed 6 bbl. of oil per day, 8/64-in. choke, 1,372,000 cu. ft. of gas per day, 47° gravity.

SOUTH LOUISIANA WILDCAT FAILURES

Calcasieu Parish: Union Sulphur & Oil Corp. 2 S. S. Hunter, Inc., 15-10s-10w, dry, TD 11,839 ft.

Iberia Parish: The California Co. 1 Jennie Kyle McKerall unit, dry, TD 11,957 ft.

Jefferson Davis Parish: Bateman Drilling Co. 1 R. Fontenont, 23-7s-5w, dry, TD 7,670 ft.

Plaquemines Parish: The California Co. 1 John Vaccaro, 1-17s-26e, dry, TD 11,505 ft.

Appalachian-Ohio

Rank Wildcat Slated In West Virginia

PITTSBURGH.—In Middle Fork district, Randolph County, West Virginia, Blaho Oil & Gas Co., located 1 B. L. & H. G. Shockey, elevation 2,062 ft., Sago Quadrangle .25 mile south of latitude, 38 degrees 50 minutes, 4.40 miles west of longitude, 80 degrees 00 minutes. Lubeck district, Wood County, Hope Natural Gas Co. 9746 E. E. Orem, elevation 607 ft., resulted in a dry hole, Corniferous lime 4,020 ft., Oriskany sand, 4,116-52 ft., show of oil 4,130 ft., TD 4,160 ft. Williamsburg district, Greenbrier County, Deep Rock Oil Corp. 1 Bertha H. Thornbury et al, had additional gas at 7,278 ft., and the test is now 660,000 cu. ft. Drilling is at 7,279 ft. Logan district, Logan County, Hope Natural Gas Co. 9715 Boone County Coal Corp., which reached a depth of 3,228 ft., will be drilled to the Oriskany sand. The Berea sand was at 3,168-99 ft.

Maryland.—Garrett County: New York State Natural Gas Corp. 2-N-247 Shaw is drilling at 7,150 ft., and encountered gas at 7,140 ft., testing 116,000 cu. ft., Cumberland & Allegheny Gas Co. 1 Noah Shrock elevation 2,465 ft., has reached a depth of 4,459 ft. The Onondaga was previously reported at 4,407 ft. Delaware Oil & Gas Co. 1 Wilt & Jacobs is drilling at 4,127 ft.

WEST VIRGINIA WILDCAT FAILURE

Wood County, Lubeck district: Hope Natural Gas Co., 9746 E. E. Orem, elevation 607 ft., dry, Corniferous lime, 4,020 ft., Oriskany sand, 4,116-52 ft., show of oil 4,130 ft., TD 4,160 ft.

OHIO

Yokum Oil and Gas 1 W. R. Wise, Lot 24, Hopewell Township, Muskingum County, a northwest offset to their 1 James Fink, logged Clinton sand at 3,146-94 ft. with 1,470,000 cu. ft. natural. The well was shot with 90 qt. and shut-in in the casing in 15 minutes with a gage of 3,375,000 cu. ft. The rock was 1,050 psi. in 15 hours.

Foraker Oil and Gas 1 Matgas, Section 5, Pleasant Township, Perry County, found the Clinton sand at 3,708-34 ft. dry, and drilled on down to the Medina sand at 3,807-12 ft., which gaged 150,000 cu. ft. The sand was shot with 30 qt. and shut in at 175,000 cu. ft. with 1,050 psi. rock. The test extends Medina field 1 mile to the southwest.

OHIO WILDCAT FAILURE

Meigs County, Chester Township: Mamot Production Corp. 1 J. L. Jewitt, Sec. 3, No Oriskany sand, TD 3,942 ft.

Canadian Fields

Fiveland Well Reports Good Flow on Test

CALGARY.—Latest drill-stem test at the Gulf-C. P. R. 4 Fiveland well, on LSD 4, 3-46-28w4, of the interval 7,159-75 ft., yielded a 1-hour flow of 62.1 bbl. of 40.5°-gravity oil into tank, with natural gas flow 56,355 cu. ft. hourly for a gas-oil ratio of 909 cu. ft. per barrel, and daily flow rate of 1,490 bbl. Present plans call for taking of 2 more 20-ft. cores, and drill-stem testing each interval. If water line has not been reached at that point, the well will then be cored down to water level with minimum delay for testing.

Fiveland topped D3 reef at 6,852 ft., 3,908 ft. below sea level, or about 200 ft. lower in elevation than D3 top at the Texaco Pigeon Lake and Bonnie Glen successes 6 to 9 miles north-northeast. Fiveland found highly productive wet gas pay for 253 ft., down to 7,105 ft., or 4,161 ft. subsea, with crude oil in the 70 ft. so far penetrated below the gas. Fiveland's gas-oil interface is about 196 ft. lower than the gas-oil interface at Pigeon Lake-Bonnie Glen, clearly establishing separate reefs.

A showing of medium gravity crude oil and another discovery of dry gas have been made in the southeastern and southwestern sectors of Saskatchewan during the past week. The oil show was recorded at the Tide Water Imperial Bender 1 Crown driller, on LSD 13, 11-12-5w2, about 93 miles southeast of Regina, while the gas discovery well, Tide Water Eastend 1 Crown is on LSD 15, 11-6-20w3, abbout 6 miles southeast of the town of Shaunavon.

Tide Water Imperial Bender 1 Crown gave a small showing of oil on drill-stem test of interval 3,905-21 ft. The Madison limestone formation tested, gave up 1 hour pipe recovery of 600 ft. of oil cut salt water. The gravity of oil recovered was about 25°.

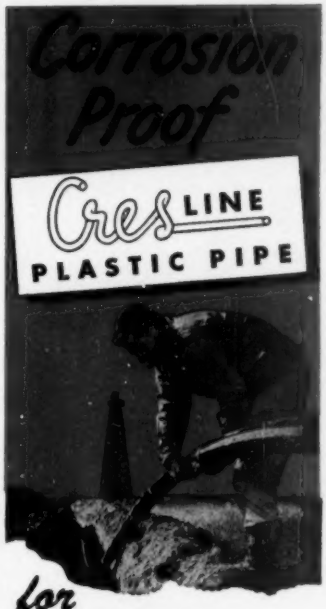
The well which accounted for the gas discovery, Tide Water 1 Eastend is located about 42 miles northeast of the Imperial Canada Southern Co-op Battle Creek Jurassic gas discovery, and Mississippian heavy gravity crude oil discovery. Gas was measured at flow rate of 3,500,000 cu. ft. daily during drill-stem test of interval 6,320-54 ft. Crew is now drilling ahead for lower objectives.

CANADIAN SUCCESSFUL WILDCATS

Phillips 1 Daysland LSD 6, 11-45-17w4, TD 3,470 ft. capped potential gas well.

Federated United 14-2 Nevis LSD 14, 2-39-22w4, TD, 5,544 ft. capped potential wet gasser.

South Brazeau Fleetwood 1 Emjay, LSD 9.



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CANADIAN WILDCAT FAILURES

Hanna 7 Berry Creek, LSD 6, 11-31-14w4, TD 4,090 ft.

Red Creek 2, LSD 3, 26-1-15w4, TD 2,563 ft.

Texaco A-1 Flood Lake, LSD 2, 25-86-26w5, TD 6,700 ft.

Delhi Socony 1 Lake, LSD 6, 19-22-15w4, TD 3,786 ft.

Merrill Asher Amerada 12-12, LSD 12, 12-49-17w4, TD 4,350 ft.

Hudson's Bay Union 12-18 North Star, LSD 12, 18-90-22w5, TD 6,085 ft.

Allenbee Peak & Associates Petrol 1 Pemukan, LSD 10, 21-34-3w4, TD 4,280 ft.

Old Smoky American Leduc 1 Saddle Lake, LSD 7, 24-60-12w4, TD 2,179 ft.

Louisiana-Ark.

New Strike Indicated In Bossier Parish

SHREVEPORT.—Carter Oil Co. has indications of a new gas-condensate strike at 1 Crystal Oil & Refining Co., SW NE 33-21n-11w, 2⅜ miles southeast of Ivan, Bossier Parish.

A 2-hour test of a sand in the Cotton Valley series was made from 9,702-16 ft., using ⅜-in. bottom and ¼-in. top chokes, with a 2,000-ft. water cushion. Fluid came to the surface in 38 minutes, gas in 44 minutes. Recovery on the test was 36 ft. of distillate, 1,080 ft. of distillate and water cushion, 120 ft. water and mud cut with distillate.

Estimates on the yield of the well are 4 bbl. per hour. The sand pay is thought to be in the basal portion of the Schuler formation. Operator is coring ahead presently below 9,716 ft.

A. W. Phillips has completed 1 S. G. Harris estate, C NW NW SE 11-13n-14w, 3 miles northeast of Grand Cane in DeSoto Parish, for a calculated open flow of 10,000 M.c.f. of gas daily from perforations 3,973-74 ft.

Arkansas.—McAlester Fuel Co. completed a new Tokio discovery in the Stamps area of Lafayette County. Pool opener is 1-A B. L. Williams, 200 ft. N of C SW SE 5-16s-23w. The discovery was completed pumping 11 bbl. of 16°-gravity oil daily, no water from perforations 2,364-73 ft. The hole was taken to 4,020 ft., but plugged back and cased to 2,428 ft. for completion.

McAlester has cemented production string at 1-A Foster-Grayson, C SW SE 3-19s-20w, wildcat 1¼ miles northeast of Emerson in Columbia County. Showings found in the Pettit will be fully evaluated. Bottom of the hole is at 5,285 ft. and was cased with 5½-in. pipe to 5,283 ft. A drill-stem test was run on the wildcat from 5,002-21 ft., with recovery being 30 ft. of slightly gas-cut mud in 20 minutes.

Shell Oil Co. is coring ahead in sand and shale at 11,821 ft. at 1 Browning-Burns unit, 660 ft. from south and east lines of Section 12-20s-23w, proposed Smackover wildcat north of Springhill, Louisiana, in Columbia Parish.

LOUISIANA SUCCESSFUL WILDCATS

Catahoula Parish: Hunt Oil Co. and Gulf Refining Co. 37 Louisiana Delta, 27-4n-5e, pumped 8 bbl. of oil from Sparta 3,709-13 ft., TD 7,000 ft. (new pay in Mittens Lake pool).

Hunt Oil Co. and Gulf Refining Co. 59 Louisiana Delta, C SW NW 23-4n-5e, flowed 50 bbl. of oil from Sparta 3,594-98 ft., TD 6,500 ft. (new pay in South Larto Lake pool).

LOUISIANA WILDCAT FAILURES

Bossier Parish: J. S. Abercrombie et al 1 Stiles, 1,075 ft. north and 2,940 ft. west of SEc 9-20n-14w, dry, TD 5,085 ft.

Caldwell Parish: H. L. Hunt 1 Louisiana Central "H," C NE SE 12-11n-2e, dry, TD 3,001 ft.

Catahoula Parish: H. L. Hunt and Gulf Refining Co. 1 The Graham Corp., 648 ft. north and 1,974 ft. east SWc 4-8n-7e, dry, TD 5,505 ft.

Concordia Parish: Justiss-Mears 1 Magoun, C SE NW 23-7n-7e, dry, TD 6,992 ft.

Barnett Serio 1 Montgomery, C NW NW 22-1n-7e, dry, TD 6,506 ft.

Morehouse Parish: Southern Carbon Co. 1 Carter, 1,219 ft. north and 1,320 ft. east SWc 35-19n-6e, dry, TD 5,304 ft.

Red River Parish: Union Producing Co. 1 Haynes "A," 250 ft. north and east SWc NW NE 20-13n-10w, dry, TD 10,515 ft.

Winn Parish: Continental Oil Co. 1 Bishop, 916 ft. north and 470 ft. east SWc 26-9n-5w, dry, TD 7,201 ft.

ARKANSAS SUCCESSFUL WILDCAT

Lafayette County: McAlester Fuel Co. and Carter Oil Co. 1 Williams "A," 200 ft. north of C SW SE 5-16s-23w, pumped 11 bbl. of oil from Tokio 2,364-73 ft., TD 4,021 ft. (discovery tentatively named North Lewisville).

ARKANSAS WILDCAT FAILURE

Ouachita County: E. G. Bradham 1 Wesson, C NW NW SE 32-14s-19w, dry, TD 3,608 ft.

Texas Gulf Coast

Deep Pay Gas Well Finaled In Harris

HOUSTON.—In Harris County on the east flank of Clinton field, H. R. Smith has completed 1 Paul Weber, Jr., as a shut-in gas well in new deep pay. Completion was finaled through 18 perforations at 8,466-72 ft. as a shut-in gas well with 2-in. tubing swung at 8,196 ft. No gage has been taken on the flow but high pressures were recorded. Hole is bottomed at 8,315 ft. with 7-in. at 6,840 ft. and 5½-in. casing cemented at 8,262 ft. with 4-in. liner in the hole. Location is on the Reels and John Trobough Survey.

Three miles southwest of Columbus in Colorado County, Warren Petroleum Corp. is preparing to plug and abandon 2 Joe J. Hanak after failing to log any commercial shows to total depth 3,410 ft. First test in the hole was made at 3,345-68 ft. after running survey to 3,368 ft. Drill-stem test failed to have any commercial shows and operator drilled to 3,410 ft. Sidewall samples taken from 3,385-3,406 ft. showed no evidence of commercial production. The failure is on the W. K. Paulding Survey, A-463.

H. J. Chavanne, trustee, has filed for permit to drill a 9,500-ft. Wilcox test in Washington County, 2½ miles southwest of Gay Hill and 6 miles west of Arthur-Harvey Wilcox field. The new wildcat venture will be drilled as 1 Robert H. Brauner and lies in the Henry Austin Survey, A-6.

In the southwest sector of Fayette County, 4 miles northwest of Flatonia and 4,700 ft.

(Continued on page 169)

Kansas

Indicated Well Revives Abandoned Millard Area

REVIVAL of the abandoned Millard area, 4½ miles west of the Trapp field in northwestern Barton County, is in prospect by an indicated producer drilled by Derby Drilling Co. The indicated producer, 1 Schneider, SE SE NE 29-16-14, ½ mile east of former production had good showings in Arbuckle lime, topped at 3,477 ft. (—1,475 ft.). A 2-hour drill-stem test at 3,488-97 ft. got 60 ft. of gas and 130 ft. of oil-cut mud, of which 120 ft. was heavily cut. Hole was deepened to 3,517 ft. and casing run through the pay to 3,516 ft.

Another new producing area for central Graham County appears to have been uncovered by Murfin Drilling Co. at its 1 Schnebly, SE SE SE 8-8-22. The well found oil showings in both the Lansing-Kansas City and Arbuckle, and now has oil string run through both zones for testing. It got the Lansing at 3,351 ft. and the Arbuckle at 3,706 ft. The latter zone was drilled to 3,721 ft., where the casing was bottomed. A drill-stem test at 3,466-3,501 ft. in the Lansing recovered 150 ft. of gas and 211 ft. of heavily oil and gas-cut mud. Location is 2½ miles east of Hill City and midway between the Harmony and Highland pools.

John Lindas Oil Co. has an indicated gas discovery in southwestern Stafford County where its 1 Seibert, NE NE SE 31-24-15, flowed an estimated 2,630,000 cu. ft. of gas per day in a 60-minute drill-stem test at 4,180-4,205 ft. in the conglomerate zone, topped at 4,170 ft. Flow pressure gaged 900 psi. and bottom-hole pressure 1,250 psi. Recovery was 30-ft. of gas-cut mud. Hole was deepened to 4,610 ft. in Arbuckle.

Birmingham-Bartlett Drilling Co. has revived the abandoned Galt pool in northern Rice County with its 1 Ferguson, NW SW NE 8-18-7, which has been completed with a pumping potential of 152 bbl. of oil per day from Arbuckle lime at 3,193-97 ft.

W. J. Coppinger's indicated Lansing oil-discovery well at the east edge of the Hugoton gas field in the area 12 miles south of Garden City, in southern Finney County, has been deepened to the Mississippian, and at latest report was drilling below 5,260 ft. Top of the Mississippian was called at 5,074 ft. No additional showings of commercial potentialities have been reported below the Lansing, where, in a 40-minute drill-stem test, previously reported, at 4,374-85 ft., the well recovered 2,250 ft. of clean oil with 3,500 ft. of gas.

KANSAS SUCCESSFUL WILDCATS

Barton County: Schio Petroleum Co. 2 Heinz "B," SW SE SW 1-19s-12w, 101 bbl. of oil from Arbuckle 3,413-17 ft., TD 3,417 ft. (new pay in Cheyenne View North pool).

Meade County: Columbian Fuel 9 Novinger, C NW SE 26-33s-30w, pumped 85 bbl. of oil from Mississippian 5,878-5,12 ft., TD 5,949 ft. PBTD 5,915 ft. (new pay in Novinger pool).

KANSAS WILDCAT FAILURES

Barber County: Continental Oil Co. 1 Gerstner, NW SW NW 9-32s-10w, dry, TD 4,950 ft.

Butler County: Rex & Morris 1 Schmidt, NW NW SE 17-26s-7e, dry, TD 2,781 ft.

White & Ellis 1 Cundell, NE NE SW 32-28s-6e, dry, TD 2,852 ft.

(Continued on page 169)

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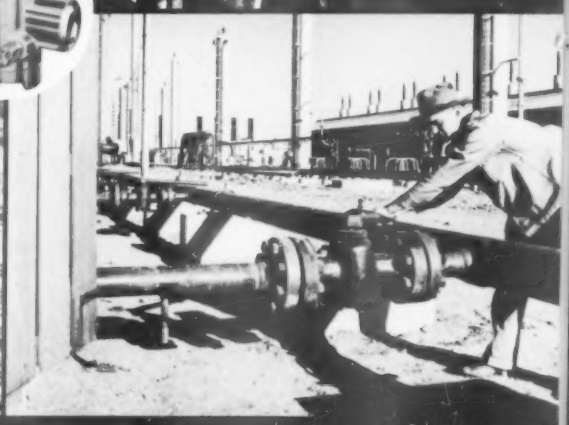

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Rocky Mountain

New Pay At Badger Basin Is Reported

DENVER.—Resolute Oil Co. of Great Falls, Montana, has a new pay discovery in the old Badger basin field in northern Park County, Wyoming. The company deepened a Frontier sand producer from 8,660 ft. and tested 5,600 ft. of 48°-gravity oil from Dakota between 9,850-70 ft. on 1-hour drill-stem test.

The well is 6 Northern Pacific, C NW SE 17-57n-101w. Flowing pressure on the test was 2,800 psi., with shut in pressure 3,500 psi. Gas flowed at the surface after 6 minutes of the test.

Resolute is conditioning hole to run liner on the well, with casing landed at 8,130 ft.

Badger Basin field was discovered in 1950, and has produced more than two million bbl. of oil from the Frontier sand. It at one time held the record for depth of production in the Rocky Mountain region. The company is already preparing to start a second deepening to confirm Dakota production in what may prove to be a very important development in the general Big Horn basin area of Wyoming.

Southeast of the new pay discovery at Badger Basin Sohio Petroleum Co. is moving on to an abandoned hole southwest of the Husky Oil Co.-Wilshire Oil Co. recent discovery of gas-distillate production in the Phosphoria in the Five Mile area of Big Horn County.

The well is 1 Government-Coltrane, C NW SW 20-49n-93w, drilled to a depth of 9,436 ft. by Carter Oil Co. in 1947 with only non-commercial shows in Frontier. Sohio acquired the former Carter holdings before the Husky-Wilshire joint venture was proved successful, and has considerable acreage in the area. Husky and Wilshire are drilling a second test 3½ miles northwest of the discovery. The beginning of operations in the old well marks the third test of the prospect which produces sour gas and will not be commercially profitable until sufficient reserves to warrant facilities for processing of the sulfur bearing gas.

Southeast of Grass Creek field in Hot Springs County, Wyoming Pacific Western Oil Co. and Ohio Oil Co. recovered 400 ft. of 76 per cent oil-cut mud on drill-stem test of the 1 Government, SW SW SE 27-46n-98w. Oil was recovered from the interval 3,845-65 ft. in Curtis sand, and the operators are drilling ahead on the joint venture.

In Southwest Wyoming the G. H. Vaughan Production Co. is coring ahead in Tensleep at 1 Unit, SW NE NW 11-15n-91w, Carbon County, after recovery of water in cores and on drill-stem test of the formation below a 30-ft. zone which produced 4,575 ft. of oil on drill-stem test a week ago for what was considered one of the outstanding developments in the state for 1952. If found commercial the well will mark the southernmost production from Tensleep in the state, and will open a large area in the Green River basin to testing to this formation.

Wyoming had 18 new locations staked this week, among them four wildcats. Operations in the state had fallen to a low for recent months with only 82 rigs active last week in comparison to 94 in late June.

Ohio Oil Co. continued the recent series of discoveries in western Nebraska and northeastern Colorado with a new Denver-Julesburg basin discovery in 1 Beyer, SW SE SW 9-14n-50w, Cheyenne County, Nebraska. The well showed 2,170 ft. of clean oil on 1-hour test of the "D" sand from 4,792-4,809 ft. Ohio is coring for the "J," the most prolific producing formation in the basin to date.

In Kimball County, Nebraska, James P. Sloss is running casing on the 1 State, SE SW SW 16-14n-54w, a recent discovery in "J" sand, after swabbing oil at the rate of 233 bbl. per day from "J" sand. Sloss has already staked a new wildcat in the same general area of the county.

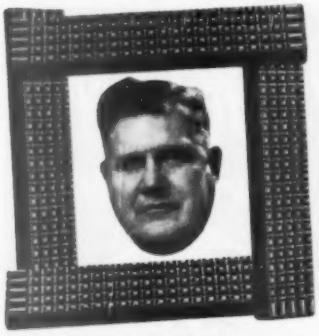
Colorado and Nebraska had a total of 13 new wildcats started this week, with seven of them in Nebraska.

In Utah, Cities Service Oil Co. has an apparent gas discovery in the Peters Point area of Carbon County in 1 Unit, C SW NW 6-13s-17e. The well test 1,260 M.c.f. gas per day from 4,625-53 ft. on 1-hour drill-stem test. Flowing pressure was 255 psi., shut in pressure 1,735 psi. The wildcat is of interest as a test of a nearly undrilled area 40 miles southeast of Duchesne field, and 15 miles northwest of the Hill Creek structure. While producing formation was not identified by the operator it is presumed to be basal Green River.

Also in Utah, The California Co. is running casing on the third wildcat in the Gusher area of Uintah County. The well is in W½ NW NE 10-6s-20e. The first wildcat in the area by this operator was a non-commercial discovery, the second was a failure. The current operation will test shows logged from 7,813 to total depth of 8,633 ft.

Amerada Petroleum Corp. is continuing to test the possible discovery at 1 North Dakota "D," C NE NW 16-153n-95w, McKenzie County, North Dakota. Latest gage was 155 bbl. of oil and 105 of water flowing from perforations 8,914-63 ft. after acid

(Continued on page 168)



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Central Area

ILLINOIS

First commercial production from the Dutch Creek (middle Devonian) sand in the Illinois basin is being opened in the Woodlawn field by Magnolia Petroleum Co. at its 7 Eubank-Winesburgh, which made more than 200 bbl. of oil by swabbing in the first 13 hours of productivity tests from that potential pay zone, open through casing perforations at 3,663-70 ft.

Location of the well, in the SW NW NW 1-3s-1e, is in the south end of the field, about 7 miles west of Mount Vernon. The field has some small production from a lower pay in the Devonian, from which oil showings where obtained in the Magnolia well, which was drilled to a total depth of 3,729 ft. The lower Devonian pay was logged at 3,719-24 ft. Other production in the field has been from the Cypress, Bethel, Rosiclare, and McClosky zones.

Pep Drilling Co. and Aubrey & Tennant 1 Anderson, McClosky lime discovery well northeast of production in the Keenville area, 4 miles north of Wayne City, Wayne County, produced at the rate of 150 bbl. of oil per day when placed on the pump. Pay is at 3,170-80 ft.

The Texas Co. has a 9-bbl.-per-day pumper at its 1 Epperson, outpost discovery well northwest of the Bungay Consolidated field, in northern Hamilton County. Pay is McClosky lime, opposite which casing is perforated at 3,406-09 ft. Spot location is in the SE SE SE 3-4s-7e.

Bell Brothers 1 Young, SE SE NW 33-5n-10e, Richland County, an outpost discovery east of production of the Dundas field in the area 7 miles north of Olney, swabbed at an average rate of 12 to 14 bbl. of oil per hour after acidizing while testing McClosky lime at 2,905-11 ft.

Three miles east of Ridgway and nearly a mile from production in the Inman West area, central Gallatin County, Calvert Drilling, Inc., and Aro Equipment Co. 1 Henderson, NW SW NW 27-8s-9e, swabbed at the rate of 90 bbl. of oil and 3 bbl. of water per day while cleaning out following an 85-quart shot in Cypress sand at 2,474-2,500 ft.

INDIANA

A new Aux Vases sand pool appears to have been found in northern Daviess County by Buell Abney at his 2 Cornelius Brothers. The well filled 250 ft. with oil while the sand was being drilled with cable tools. Pay was logged at 551-53 ft. Location, in the NE SE SW 6-5n-5w, just south of the Greene County line, is 4 miles from nearest production, the Odon pool in Section 19, which also produces from the Aux Vases sand at approximately the same depth. It is 4 miles east of Elnora, and also southeast of the old Lyons gas area, in Greene County.

Francis Beard has completed his 1 Kolb, an outpost well ½ mile from production in the area northeast of Princeton, Gibson County. The well, located in Fractional Section 21-1s-10w, pumped at the rate of 336 bbl. of oil per day. Pay is in the Aux Vases zone at 1,818-25 ft.

WESTERN KENTUCKY

M. W. Howard is preparing to test his 1 Lora MacHensley, an indicated McClosky lime discovery well in the northern tip of Daviess County. The well, located in the SE SE NW 19-Q-27, 4 miles northwest of Stanley, and 2 miles from nearest production (the Reed East pool to the west in Henderson County), recovered 155 ft. of oil and 30 ft. of mud-cut oil without any water in an 110-minute drill-stem test in the McClosky at 1,782-1,808 ft. Total depth is 1,820 ft. with casing on bottom.

EASTERN KENTUCKY

In Greenup County, 19-X-79, Van Everman et al have added an extension to Oldtown pool. Located southwest of production No. 1 Hall was completed for 8 bbl. of oil daily from the Corniferous lime topped at 1,318 ft. and bottomed at 1,324 ft. Well was given a 500 gal. Stratafrac treatment.

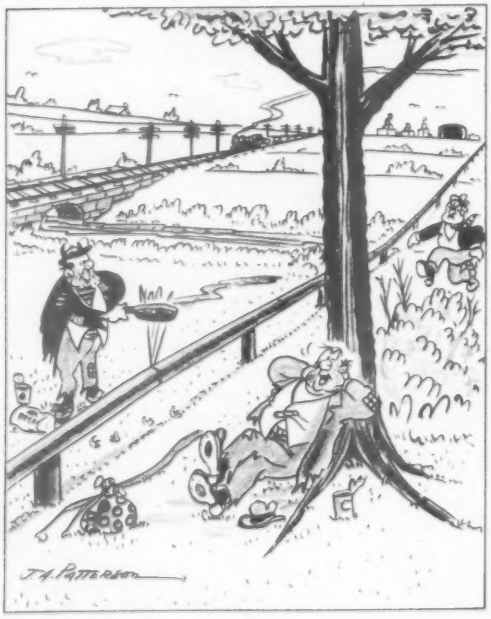
Also in Greenup County, 24-X-80 Arnold et al are drilling a wildcat at 1 Elmer Howard. Located 3 miles southeast of the Greenup pool test is drilling at 930 ft. in the Berea with a good show of oil. Operators may test at this horizon.

MICHIGAN

The Michigan oil industry this week was closely watched due to the Ogma Development Co. 1 Weiler, E½ SE SW 14-22n-1e, Ogemaw Township Richfield oil test, Ogemaw County, which was being tested in that objective horizon with some free oil showing. This well is located on the northwest side of the big and older West Branch Traverse and Dundee oil pool.

Well was under test at 4,180 ft., but was scheduled to be deepened further in the objective, perhaps to the black lime Richfield zone base. First oil show in the Richfield was logged at 4,127-35 ft. A better pay was drilled from 4,165-77 ft. After standing shut in for 2½ days while tanks were moved in and well was hooked up, hole showed about 400 ft. of fluid, which was swabbed out and

(Continued on page 168)



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How Dehydration Curtails Corrosion

(Continued from page 98)

In July 1951 it was found necessary to replace the desiccant in two of the towers because it was no longer possible to obtain a 24-hour run through the plant without exceeding the p.p.m. of water permissible in the outgoing product. After replacing the desiccant in two towers, dehydration was accomplished by operating the plant with one tower containing old desiccant and one tower containing new desiccant on stream together. With this method, sufficient water removal was realized to render it unnecessary to change the desiccant in the other two towers.

A typical set of desiccant degeneration curves for a complete dehydration cycle is shown in Fig. 4. The cycle depicted covers a 94-hour run consisting of 54,000 bbl. of housebrand gasoline and 12,000 bbl. of furnace oil No. 1. During this cycle one tower containing comparatively fresh desiccant and one tower containing "old" desiccant were on stream together.

The curves indicate quite clearly that the newer desiccant removes a much higher percentage of water than does the old. Also the dehydrator removes a higher percentage of water when the product is more nearly water saturated. The housebrand gasoline received after the tank change noted on the curve had a higher saturation than the first of the batch, and the furnace oil No. 1 contained more water than the gasoline.

It will be noticed that simultaneous with the batch change to furnace oil, the pumping rate was increased, and the effectiveness of the desiccant dropped rapidly. However, a later reduction in rate permitted the dehydrator to remove more water.

Control methods . . . The operation of the dehydrator is essentially manual. The temperature of the heated natural gas is thermostatically controlled, and the water separator and knockout drum, by means of float-operated valves, automatically decant the water and water-slop mixture respectively trapped in them, but the rest of the operation must be controlled by the station engineer.

Several protection devices are provided to assure the safety of the operator and the plant. The pilot flame in the gas heater is customarily left burning, but in the event it is extinguished, it is relit by means of an electric igniter. A Flame-o-trol controlled solenoid valve cuts off the gas supply to the pilot when the flame is extinguished, and at the same time causes an alarm horn to sound.

The solenoid valve on the gas supply to the main burner cannot be opened unless the compressor is running. This assures a flow of gas through the furnace while the burner is lit. This valve will also close if the flame is extinguished or if the compressor stops. A Limitrol, set at 1,000° F., is located in the brickwork high in the furnace and prevents overheating of the furnace by closing the burner valve when the Limitrol thermocouple senses that temperature.

The alarm also sounds when the water level in either the water separator or gas-slop separator is too high; when the makeup gas pressure exceeds 95 psi.; when the differential pressure across the dehydrator exceeds 30 psi.; or when the recycling gas temperature exceeds 515° F.

Temperatures at various points along the gas system are recorded on a Brown electronic strip chart potentiometer, thus enabling the operator to observe the progress of the regeneration cycle. The curves taken from a typical cycle are shown in Fig. 5.

Comparatively few operating difficulties have been encountered in the operation of the Strouds dehydrator. The Wyco line transports 7 gasolines, 2 diesel fuels, 2 low-flash tractor fuels, and 3 burning fuels for a total of 14 products. During initial operation of the dehydrator, the towers were bypassed during changes from gasolines to oils, and vice versa, and the following product was turned through fresh towers. This was done to minimize interfacial commingling.

Changes from dyed to undyed products were handled in the same manner. Experiments proved, however, that this procedure was unnecessary. The amount of the gasoline-oil interface was increased only 9 per cent at the terminal when the interface was passed through the towers. This increase, which amounts to approximately 15 bbl. in gasoline-to-gasoline interfaces and 25 bbl. in gasoline-to-refined oil interfaces, has no material effect on the handling of the mixture at the terminals. Furthermore, running interfaces through the towers greatly reduces the number of regenerations required and thus extends the life of the desiccant.

It was also found that, while new desiccant picked up color from dyed products and transmitted it to undyed products, this action ceased after a few regenerations. A somewhat similar condition existed with respect to oxidation inhibitors. Although new desiccant removed some inhibitor, it did not lessen the quality sufficiently to affect its action. After the desiccant had been regenerated a few times, no effect on the inhibitor was detected.

It was expected that carryover of alumina fines into the line meters during initial operation might cause an undue amount of meter and pump repairs. We found, however, that either the particles carried over were so finely divided that they carried through the meters and pumps without causing any damage, or at the rates at which we were pumping, a very small amount of fines was carried from the towers, because no difficulty was encountered in this regard.

Maintenance . . . When the plant was first placed in operation, all valves on the recycling hot gas lines were lubricated plug valves. Unfortunately the high-temperature lubricants, with which the valves were originally lubricated, rendered the valves virtually inoperable at the very low temperatures encountered during the winter. Other lubricants, which operated satisfactorily at the low temperature, cooked out when the gas temperature approached 500° F. A great many different lubricants were tried in an effort to find one that would give satisfactory operation from subzero temperatures to temperatures around 500° F.

None of those tried proved satisfactory and it was necessary to replace these valves with gate valves. The gate valves operated very well for a short time. However, it developed that desiccant fines and carbon were being trapped in the valves in such a way that the valve discs could not be properly seated. To correct this condition we drilled and tapped the bottom of the valves and installed ½-in. blow-down valves so that the line valves could be periodically blown free of fines. Since this was done no further difficulty has been experienced.

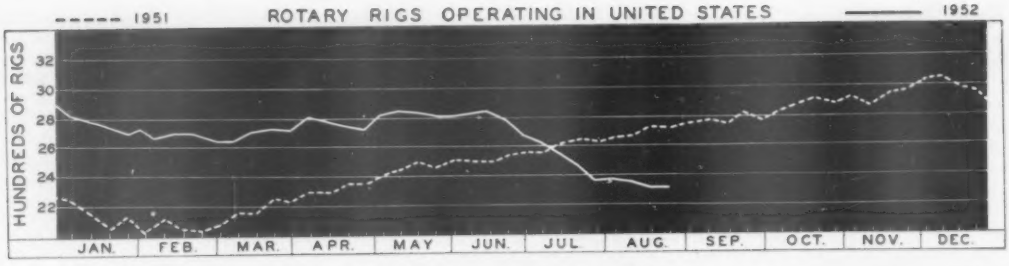
Because of the simplicity of operation of the dehydrator, actual attendance by an operator is required only at the beginning and end of the regeneration cycle. Most of the labor charged against the opeartion consists of general maintenance and the chemist technician's time spent in running titrations. It was not necessary to augment the crew of station engineers to handle the dehydrator.

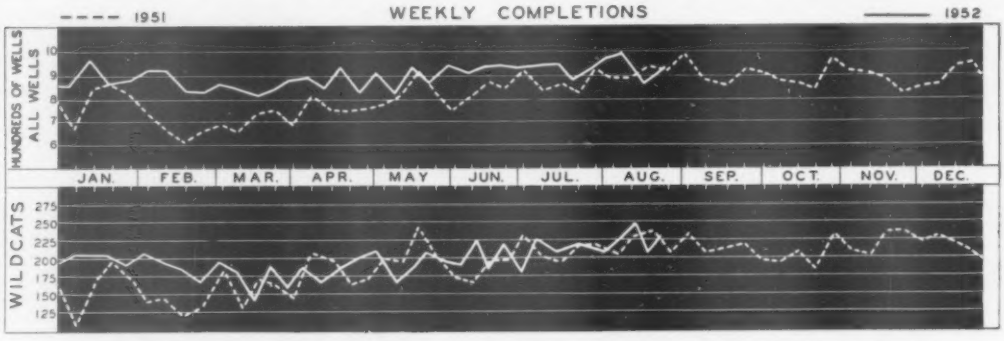
Costs . . . The dehydration cost per thousand barrels for the year 1951, excluding depreciation and taxes, was as follows:

Operating Cost

Labor	$0.47
Gas and electricity	.20
Desiccant replacement	.17
Maintenance (Materials)	.06
Per 1,000 barrels	$0.90

At 20,000 bbl. per day designed capacity, the operating cost will reduce to $0.68 per 1,000 bbl.





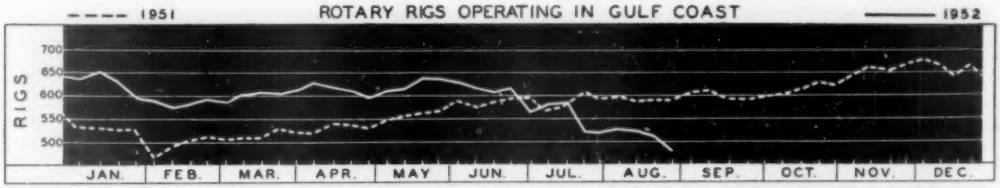
CURRENT STATISTICS

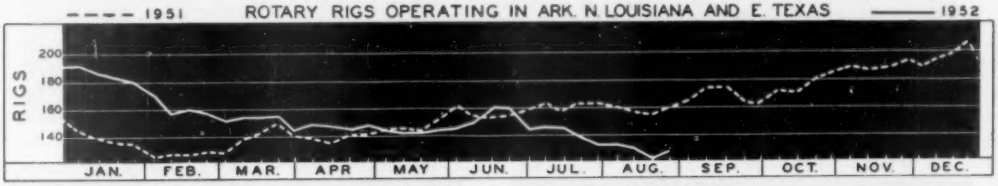
EXPLORATION

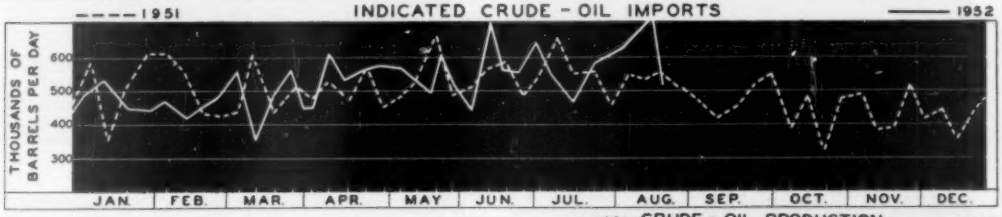
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 23, 1952

	Total of all wells					Aug. 23		Wildcat completions and discoveries					Cumulative total, 1952				
	Comp.	Oil	Gas	Dry	Footage	1952	1951	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	18	9	0	*9	26,375	488	407	0	0	0	0	0	0	0	0	2	2
Pennsylvania	47	21	5	†21	86,200	1,237	1,052	0	0	0	0	0	0	0	0	2	2
West Virginia	15	0	11	4	49,142	406	367	0	0	0	1	1	0	0	2	5	7
Ohio	25	8	8	9	55,859	648	600	0	0	0	1	1	2	0	7	16	25
Indiana	25	9	0	16	36,503	803	780	0	0	0	8	8	22	0	2	228	252
Kentucky	20	8	0	12	37,963	832	752	0	0	0	7	7	15	0	1	161	177
Illinois	48	17	0	31	119,984	1,235	1,508	0	0	0	13	13	10	0	0	354	364
Michigan	17	8	1	8	40,268	465	481	0	0	0	4	4	21	0	4	157	182
Kansas	76	28	10	‡38	255,241	3,096	2,798	2	0	0	10	12	71	0	10	494	575
Nebraska	13	2	1	10	60,869	184	142	0	0	1	4	5	7	0	1	97	105
Oklahoma	103	61	1	‡41	357,567	3,820	3,548	3	0	0	15	18	76	2	8	399	485
Texas	330	185	18	127	1,605,369	11,600	10,436	23	2	2	76	103	526	38	79	2,483	3,126
N. Central (Dist. 7-B & 9)	116	67	0	49	398,452	3,662	3,186	17	1	0	34	52	294	2	23	1,049	1,368
West (Dist. 7-C & 8)	98	72	0	26	622,188	3,619	3,133	4	0	0	14	18	114	0	5	449	568
Panhandle (Dist. 10)	13	2	6	5	54,973	443	430	0	0	1	3	4	4	0	6	35	45
Eastern (Dist. 5 & 6)	27	14	2	11	121,761	629	778	0	0	0	6	6	15	3	2	148	168
Gulf Coast (Dist. 2 & 3)	36	20	1	15	247,961	1,694	1,468	1	1	0	5	7	56	23	18	349	446
Southwest (Dist. 1 & 4)	40	10	9	21	160,034	1,553	1,441	1	0	1	14	16	43	10	25	453	531
Louisiana	77	41	8	28	518,853	1,498	1,310	2	2	2	12	18	28	14	11	195	248
Northern	44	22	4	18	174,402	807	704	2	0	0	8	10	12	0	7	90	109
Southern	33	19	4	10	344,451	691	606	0	2	2	4	8	16	14	4	105	139
Arkansas	11	7	0	4	37,538	253	252	1	0	0	1	2	5	0	0	50	55
Mississippi	7	2	0	5	53,383	229	208	2	0	0	3	5	13	2	1	104	120
Southeastern States	1	0	0	1	5,504	42	35	0	0	0	1	1	3	0	1	24	28
Montana	12	5	0	7	41,886	194	136	0	0	0	4	4	4	0	1	45	50
Wyoming	9	3	0	6	31,695	451	454	0	0	0	4	4	18	0	3	73	94
Colorado-Utah	4	0	0	4	20,429	332	163	0	0	0	3	3	16	0	7	133	156
New Mexico	25	17	4	4	144,746	690	417	2	0	0	2	4	24	2	1	70	97
California	48	37	0	11	222,368	1,592	1,428	4	0	0	9	13	57	0	4	310	371
North Dakota	3	1	0	2	20,518	48	5	0	0	0	2	2	3	0	0	14	17
Miscellaneous	0	0	0	0	0	49	64	0	0	0	0	0	0	0	18	18	36
Total United States	934	469	67	398	3,828,260	30,192	27,343	39	4	5	180	228	921	58	161	5,434	6,574
Total previous week	864	439	63	362	3,411,404			34	1	6	165	206	882	54	156	5,254	6,346
Total August 25, 1951	911	467	66	378	3,536,798			30	0	4	171	205	955	48	171	5,030	6,204

Service wells included: *9, †18, ‡1.



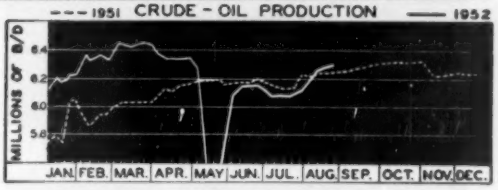


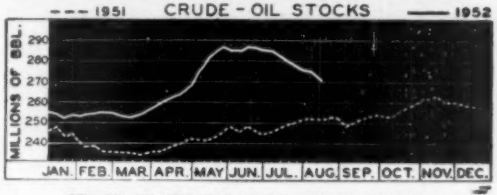


DAILY AVERAGE PRODUCTION FOR WEEK

	August 23, 1952 — Crude oil	Lease condensate	Total	Aug. 16 total
Alabama	2,850		2,850	2,900
Arkansas	75,625	4,175	79,800	83,350
California	988,200		988,200	984,000
Colorado	83,700		83,700	80,300
Eastern	58,900		58,900	59,600
Florida	1,700		1,700	1,650
Illinois	165,300		165,300	166,700
Indiana	33,700		33,700	33,300
Kansas	331,700		331,700	324,850
Kentucky	32,800		32,800	33,000
Louisiana	637,325	32,800	670,125	670,875
North	111,200	9,800	121,000	121,750
South	526,125	23,000	549,125	549,125
Michigan	43,200		43,200	36,800
Mississippi	92,550	3,450	96,000	96,400
Montana	26,900		26,900	27,000
Nebraska	7,000		7,000	7,050
New Mexico	160,500	300	160,800	160,900
Oklahoma	530,600		530,600	528,700
Texas	2,749,275	41,575	2,790,850	2,790,850
Dist. 1	33,175	125	33,300	33,300
Dist. 2	151,100	3,850	154,950	154,950
Dist. 3	446,850	24,000	470,850	470,850
Dist. 4	244,950	4,400	249,350	249,350
Dist. 5	45,200	200	45,400	45,400
Dist. 6	117,825	3,600	121,425	121,425
E. Texas field	263,000		263,000	263,000
Dist. 7-B	98,000	50	98,050	98,050
Dist. 7-C	148,725	4,900	153,625	153,625
Dist. 8	939,875	200	940,075	940,075
Dist. 9	178,475	250	178,725	178,725
Dist. 10	82,100		82,100	82,100
Utah	4,300		4,300	4,400
Wyoming	183,000		183,000	183,000
North Dakota	4,500		4,500	5,000
Total U. S.	6,213,625	82,300	6,295,925	6,280,625
Change from previous week, up			15,300	
Canada	210,500		210,500	207,700
Total U. S. production January 1-August 23			1,442,153,900 bbl.	
Same period last year (crude plus cond.)			*1,436,084,750 bbl.	

*Includes 19,223,500 bbl. condensate.



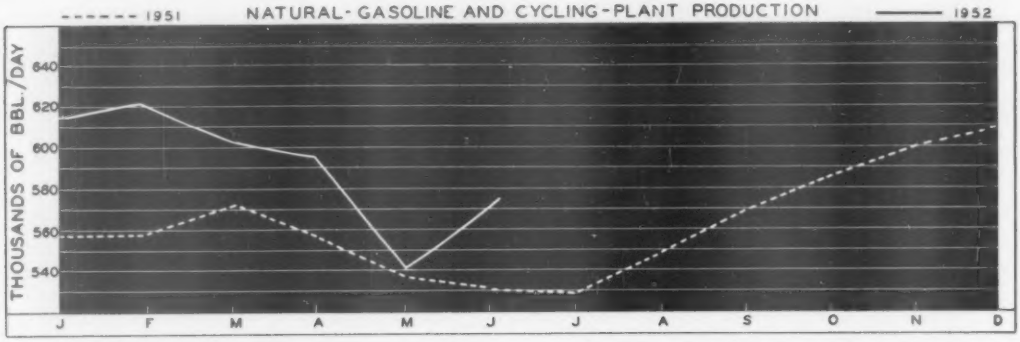


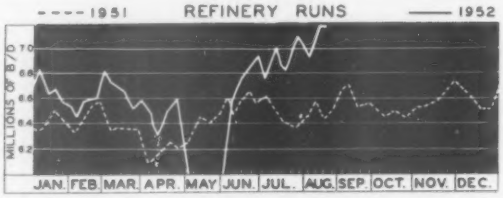
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

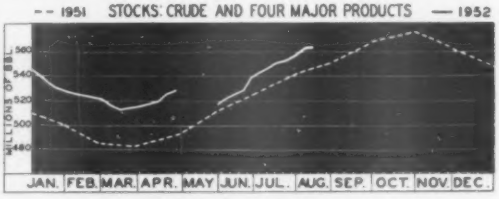
(Thousands of barrels daily)

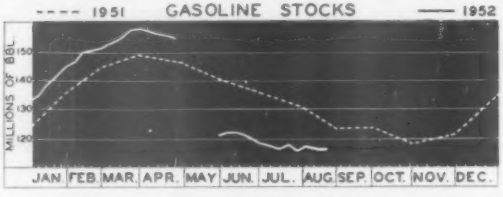
	Aug. 16, '52	Aug. 9, '52	Aug. 18, '51
Pennsylvania Grade	2,406	2,336	2,118
Other Appalachian	2,044	2,083	1,497
Illinois, Indiana, Michigan	12,843	12,997	10,967
Arkansas	3,147	3,048	2,640
Louisiana	15,536	15,588	14,349
North	2,338	2,533	3,061
Gulf	13,198	13,055	11,288
Mississippi	3,761	3,767	3,024
New Mexico	7,489	7,513	6,553
Oklahoma and Kansas	40,329	40,213	38,693
Texas	129,700	131,856	120,436
East Texas proper	12,937	12,824	(†)
West Texas	57,056	57,965	(†)
Texas Gulf	28,010	28,389	(†)
Other Texas	31,697	32,678	(†)
Rocky Mountain	14,277	15,443	13,529
California	30,673	31,715	30,378
Foreign	8,361	9,099	7,974
Total	270,566	275,658	252,158

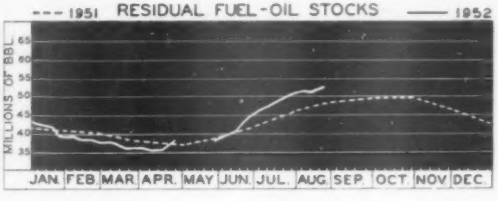
*Bureau of Mines. †Not comparable with current week.









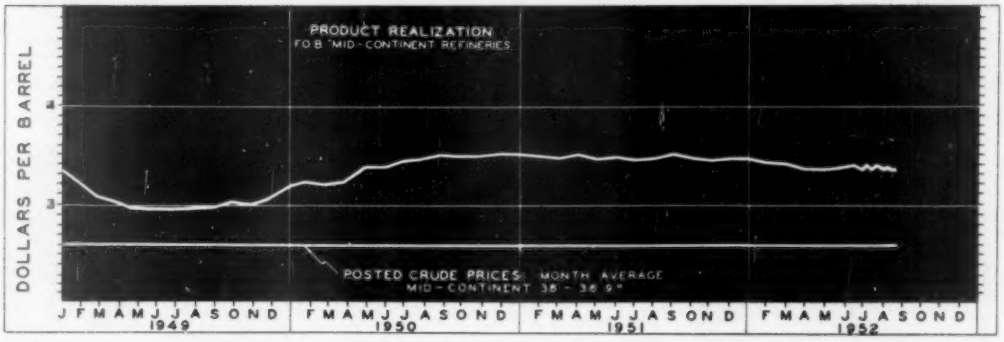


A.P.I. REFINERY REPORT, AUGUST 23

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1951 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,055	432.9	42.1	213.7	252.7	28,713	13,437	35,422	13,109	1,026	415.3	41.0	230.1	228.1
Appalachian:														
District 1	107	43.9	4.1	14.3	12.7	3,457	591	1,429	836	104	41.6	5.3	17.4	11.9
District 2	89	45.1	3.2	17.7	14.6	1,877	317	518	400	73	33.1	3.5	8.9	15.7
Ind., Ill., Ky.	1,345	720.0	77.7	256.3	166.4	24,479	6,744	20,599	6,404	1,203	640.4	69.9	197.2	150.5
Okla., Kans., Mo.	626	338.6	16.6	147.3	63.6	10,982	1,903	11,967	1,596	482	264.6	11.8	117.1	53.1
Inland Texas	266	178.4	12.4	43.7	39.0	4,006	470	2,071	1,092	256	173.0	12.5	39.2	41.5
Texas Gulf Coast	1,768	793.9	130.7	458.7	288.4	16,167	3,935	10,537	7,961	1,586	739.9	118.9	312.0	257.0
La. Gulf Coast	546	257.3	66.6	125.6	51.1	6,455	2,197	3,406	2,103	501	235.0	54.9	118.7	59.8
N. La. and Ark.	84	32.7	8.0	21.1	5.1	2,650	527	1,045	213	85	35.0	7.9	16.7	7.7
Rocky Mountain:														
New Mexico	18	10.4		2.9	3.9	100		71	33	16	9.0	0.1	3.3	3.7
Other Rocky Mtn.	243	112.6	5.6	44.0	44.0	3,202	383	2,094	1,290	227	103.4	5.2	43.5	41.1
California	1,027	449.1	0.6	134.6	367.2	14,305	310	10,410	17,067	980	423.7	7.9	132.5	355.5
August 23, 1952	7,174	3,414.9	367.6	1,479.9	1,308.7	116,393	30,814	99,569	52,104	6,539	3,114.0	338.9	1,236.6	1,225.6
August 16, 1952	7,177	3,304.0	379.6	1,477.4	1,245.7	115,979	29,721	95,280	51,959					
August 25, 1951	6,500	3,084.6	322.0	1,251.6	1,251.9	125,590	31,967	91,692	47,906					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
DOLLARS PER BARREL
POSTED CRUDE PRICES, MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1949
J F M A M J J A S O N D
1950
J F M A M J J A S O N D
1951
J F M A M J J A S O N D
1952

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate and fuel oil. Realization averaged $3.33 for week ended August 16, $3.33 for previous week, and $3.48 for August 1951. The above trend information is based on volumes and current prices and therefore does not reflect changes in operating costs.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of August 27, 1952. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10¾-10½	12.125-12.75	10¾-11
Premium gasoline, 86-88 octane	11¾-11½	13.75-14.0	11¾-12
42-44 w.w. kerosine	8½-8¾	10.65	9-9.25
No. 2 straw fuel oil	7½-8	9.65	8-8.25
No. 6 residual	$0.90-1.00	$2.10-2.25	$1.50-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	6⅜	5⅞	6⅛
Grade 18-55	7.65	7.15	7.40

LUBRICATING OILS
South Texas

200 vis., No. 2-3 neutral	13-13.5
750 vis., No. 3-4 neutral	16
2,000 No. 5-6 neutral	18-19

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	27-28
200 vis., No. 3 neutral, 0-10 pp.	14.5-15.5

Western Pennsylvania

145-155 vis., 10 p.t. bright stock	32.5
180 vis., 0 p.t. neutral	31.5

WAX
Mid-Continent

132-134 A.M.P.	5.5

GASOLINE shipments from primary storage have remained high in August with most of the material supplied from current production. Total gasoline stocks decreased only 1,401,000 bbl. in the 4-week period ended August 16.

Production of gasoline for delivery to customers in September, when higher vapor pressures will be needed in some market areas, has brought increased demand for natural gasoline. This higher demand resulted in two price increases for the week ended August 23. A raise of 0.125 cent a gallon was reported for August 22 and another gain of 0.5 cent on August 23. This brings the Group 3 price for Grade 26-70 natural to 6.375 cents. The price after the last increase is the same as postings after the increase on September 11 last year. Prices dropped earlier last spring than in 1951 and now seem to be climbing a little faster than they did last year.

Movement of kerosine and distillate fuel is less than at this time last year. Before the increase in ceiling prices for the East Coast areas, many secondary suppliers and jobbers were in the market for kerosine and distillate fuel to build inventories for the winter. For the country as a whole, these sales for storage seem to have dropped off in August. Calculated demand for kerosine for the 4-week period ended August 16 was 18 per cent less than for the same period last year. Distillate demand was down 8 per cent for the same period.

Additions to primary storage of kerosine and distillate in the period represented a little more than 43 per cent of refinery production of these products.

The threat of a shipyard strike has caused some tanker owners to postpone ship strapping jobs. Greater tanker availability has resulted in lower spot rates for dirty tankers within the past week.

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.‡	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.93			
19-19.9	1.98			
20-20.9	2.03	$2.25		$2.12
21-21.9	2.07	2.27		2.14
22-22.9	2.12	2.29		2.16
23-23.9	2.18	2.31		2.18
24-24.9	2.24	2.33	$2.56	2.20
25-25.9	2.30	2.35	2.58	2.22
26-26.9	2.36	2.37	2.60	2.24
27-27.9	2.41	2.39	2.62	2.26
28-28.9	2.46	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.57	2.45	2.68	2.32
31-31.9	2.62	2.47	2.70	2.34
32-32.9	2.68	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947.

‡Standard Oil Co. of California.

FLAT CRUDE PRICES

Representative posted schedules per barrel. Kettleman Hills, California*	$2.80
Louisiana:	
Beauregard Parish	2.60
Cotton Valley (distillate)	2.85
Cotton Valley (crude)	2.70
Texas:	
East Texas	2.65
Pecos County (Yates)	2.35
Conroe	2.83
Van	2.48
Pennsylvania Grade:	
Bradford	4.25
Southwest Pennsylvania	3.82
West Virginia	3.76
Illinois Basin	2.77

*37°-37.9°.

EQUIPMENT MEN . . . in the News

Pelton Announces Field Service Headquarters

In order to handle an increase in demand for Pelton long-stroke hydraulic pumping jacks, C. J. Woodard, manager of Oil Industry Machinery Division, Pelton Water Wheel Co., has

CLYDE LEITZOW — TOM GARRISON

W. A. McKNIGHT — GENE BELL

announced the following personnel appointments to its field sales organization.

Clyde Lietzow, formerly with Pelton's California office, has become manager of the Dallas office. Tom Garrison is named California sales and service engineer working out of the Los Angeles office, replacing Lietzow. W. A. McKnight directs activities at Pelton's Houston office. Gene Bell has been named manager of the Odessa office, and will be assisted by N. N. (Gene) Bagley.

Lietzow has been active in the Pelton sales and service departments in the California oil field during the past 6 years. He is a graduate in mechanical engineering from University of Michigan.

Fleager to Manage New Hycalog Offices at Houston

Hycalog Co., core-analysis and well-logging firm of Shreveport, La., has recently opened offices and core-analysis laboratories in Houston. Samuel J. Fleager, well known throughout the Houston area where he has been engaged in the core-analysis field for the past 4 years, has been named office manager. Sherwood L. Thomas, formerly of Hycalog home office in Shreveport, will be in charge of operations.

The Houston office will offer on-location core analysis, off-location core analysis, sidewall core analysis, and diamond coring, in addition to the regular Hycalog hydrocarbon well-logging services.

Additional offices of the company are located in Corpus Christi and Midland, Tex.; Mexico City, Mexico; Mount Pleasant, Mich.; Jackson, Miss.; and Lafayette, La.

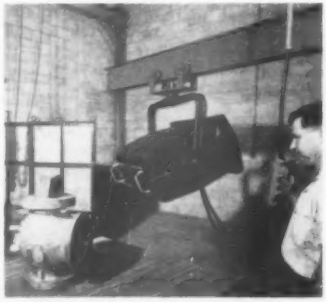
Schutte & Koerting Adds Product Testing Plant

A significant technological procedure has been added by Schutte & Koerting Co. at its Cornwells Heights, Pa., plant. It is an advanced method for quality control of steel equipment the company produces for use in high-pressure, high-temperature power plants and in process plants.

The development centers around an X-ray machine, a radioactive metal, and a group of skilled technicians. Put into operation just this month, the new technique involves use of short-wave rays to photograph solid steel castings for the detection of hidden flaws or defects.

The technique is known as radiographic inspection. The short-wave rays are used to penetrate the object being inspected. Film will reveal irregularities in the metal.

X-ray machines rays are used to penetrate castings up to 3 in. thick, while cobalt 60 rays, which have power equivalent to slightly over 1,000,000 volts, are used to penetrate castings up to 7 in. thick.



Here X-ray machine photographs steel casting.

Personnel Changes Made by Welex in Gulf Coast Area

W. H. GRIFFIN

Welex Jet Services, Inc., recently announced the promotion of W. H. Griffin from Gulf Coast division manager to the newly created position of assistant to A. M. Birnie, sales manager. J. B. Fleming has been promoted from Corpus Christi, Tex., district manager to replace Griffin as Gulf Coast division manager.

J. B. FLEMING

BRACEWELL

L. M. Bracewell, formerly assistant to Fleming, has been named Corpus Christi district manager.

In his new position Griffin will participate in over-all management problems throughout the entire Welex service area, and will maintain headquarters in Houston.

Fleming's new duties will include the responsibility for over-all supervision of four Gulf Coast districts. His headquarters will also be located in Houston.

Welex has also moved its West Texas division offices from Odessa to Midland, Tex. Wayne Satterwhite, division manager, has moved his headquarters to the new Midland location.

Stockham Purchases New Orleans Valve Firm

The recent purchase of Wedgeplug Valve Co., Inc., New Orleans, by Stockham Valves & Fittings, Birmingham, Ala., has been announced by Herbert Stockham, president of the pioneer valve-manufacturing firm.

Appointed as general manager of Wedgeplug was Ned Jones, formerly products development director of Stockham. The new board of directors for Wedgeplug consists of Leo P. McCur-

nin and Christian Nielsen, both of whom served on the original board; Tom B. Noble; Douglass W. Stockham, and Richard J. Stockham.

Although an affiliate of Stockham Valve & Fittings, Wedgeplug will continue to operate as a separate corporation and will continue to produce the same line of steel valves it has always made.

Bovaird Supply Moves J. M. Welsh to Dallas

Bovaird Supply Co. has augmented its sales force in the Dallas district sales office with the transfer of Joseph M. Welsh from the Tulsa headquarters. Having specialized in wire-rope sales with American Steel & Wire Co. in the Southwest, Welsh has had some 20 years' experience in sales in the Texas and New Mexico territory.

Welsh spent several years in his own supply business, and 2 years as a drilling contractor before he joined Bovaird at the Tulsa sales office.

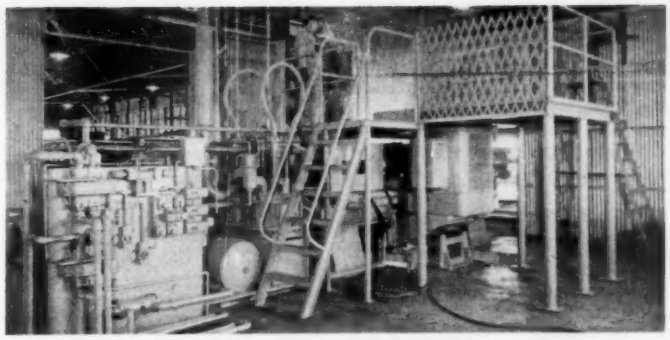
Brinker Is Made Assistant Executive for A. O. Smith

J. H. BRINKER

J. H. Brinker has been appointed assistant executive in charge of distribution at A. O. Smith Corp. in Milwaukee. He recently moved into this new position from his former assignment of general sales manager for A. O. Smith's Southwest district, with headquarters at Houston.

According to L. B. Smith, president of the company, Brinker will coordinate all matters related to distribution of the company's products. He also will provide general management service and direction to the manufacturing divisions in the distribution and marketing field. He will supervise advertising and sales promotion, exhibits and displays, and market analysis.

Besides his association with A. O. Smith, Brinker is a member of the board of directors of Automatic Enterprises of Texas, which operates coin appliances in Houston, and Calter Corp., shrimp packers of Palacios, an affiliate of American Research & Development Corp.



American Iron Expands Flashwelding Facilities

American Iron & Machine Works Co., Oklahoma City, has recently expanded its flashwelding facilities for attachment of tool joint to drill pipe by installation of a new flashwelding machine installed at its No. 2 plant in Oklahoma City. The new Swift electric flashwelder, shown here, is the fifth of its kind to be manufactured and one of the largest in existence.

Lane-Wells Co. Names Whitcraft, Gamberg

Lane-Wells Co. has announced the appointment of W. B. (Bill) Whitcraft, and R. J. (Russ) Gamberg as sales engineers of the company's Mid-Continent division. Whitcraft is a graduate of the U. S. Maritime Academy. He began his Lane-Wells career in 1948 as a shell loader, and was made a rigman after a few months. He later became a perforator operator, and finally a radioactivity operator. Whitcraft's headquarters are in Russell, Kans.

WHITCRAFT

R. J. GAMBERG

Gamberg is a graduate of South Dakota School of Mines. He joined Lane-Wells in 1950, and has specialized in radioacticity well logging. He is currently in the Casper, Wyo., office.

Web Wilson Makes Changes In Sales Representation

Several recent additions and changes in sales representation of Web Wilson Oil Tools include the appointment of Ray E. Gorman as Mid-Continent representative, who will assist Mid-Continent, Rocky Mountain, and western Canada sales agents. He will remain temporarily in Wichita, Kans., until establishment of permanent offices at Dallas.

Kansas and eastern Nebraska will be covered by Noel Swick, who will headquarter at Great Bend, Kans. Swick has been assistant to Gorman for the past 3 years.

William J. (Bill) Davis has transferred to the Oklahoma and Texas Panhandle territory, and will headquarter at Oklahoma City.

George S. Badger has been appointed Canadian sales agent for Web Wilson, and will be assisted by John Harvie, Bernie Davis, and Hugh Calder, all well known in Canada. Badger's headquarters are at Calgary, and a warehouse is also maintained at Edmonton.

Geophoto Services, Inc. Opens Offices in Calgary

J. ALLIGER

Geophoto Services, Inc., Denver consulting firm specializing in photogeologic evaluation, has recenily opened offices in Calgary, Alta.

Jerald Alliger, who has been with the firm since 1946, has been named manager of the Canadian office. He will be assisted by Bruce Coombs and Richard Bryson, who have been transferred from Denver, and J. W. Antal, recently with Denton-Spencer Co., Ltd., Calgary. Robert McCulloch is on temporary assignment from Denver to Calgary as research geologist.

Geophoto Services began operations

in January 1946. Since that time the staff has grown from the original four partners: V. Zay Smith, Robert McMillan, A. R. Wasem, and L. Brundall, to over 80 geologists, cartographers, and photogrammetrists.

Continental Announces New Store Openings

B. J. VEACH

V. E. HAYS

The recent opening of two new stores by The Continental Supply Co., Dallas, has been announced by Frank I. Brinegar, executive vice president.

With Bill J. Veach as manager, a store has been opened in Glendive, Mont., which point will serve the Montana portion of the Williston basin, with the exception of Poplar field area. This store will operate under the direct supervision of W. D. Craig, district manager, Casper, Wyo.

Vernon E. Hays has been named manager of a newly opened store at Hadacol Corners, Tex. This store will serve the northern portion of Reagan County, northeast portion of Upton County, southeast portion of Midland County, and all of Glasscock County. In his new position, Hays will function under the direct supervision of W. T. Hays, assistant district manager, Midland, Tex.

Bromiley to Represent Manzel in Oklahoma-Kansas

Manzel, Inc., manufacturers of force-feed lubricators and chemical feeders, is now represented in the Oklahoma - Kansas area by Edward C. Bromiley, Tulsa. Bromiley has been associated with the oil industry for 20 years, in research, engineering, and sales for a number of prominent refiners and equipment manufacturers. He is especially well qualified to assist the petroleum industry in solving chemical feeding and lubrication problems. Manzel home offices are at Buffalo, N. Y.

Schlueter, Sullivan to Study European Plants

W. A. SCHLUETER

William A. Schlueter, founder and president, Refinery Supply Co., Tulsa, and H. M. Sullivan, research director of Central Scientific Co., an affiliate of Refinery Supply, have left the United States for an extended visit to refineries and scientific manufacturing plants in Europe.

Schlueter and Sullivan also hope to consummate arrangements by which Refinery Supply and Central Scientific will acquire interests in European scientific concerns.

Their lengthy tour, being made expressly for the purpose of acquiring information that may be used in furthering the expansion and development of scientific research, and designing and manufacturing knowledge in this country, will include plant inspections at Amsterdam and Eindhoven, Netherlands. From the Netherlands they will go into Germany where they will study plant methods at Berlin, Hamburg, Dusseldorf, Bonn, Frankfurt, Gottingen, Darmstadt, Stuttgart, and Munich.

In addition, Schlueter and Sullivan will study precision plants at Milan, Italy, and at a number of cities in Switzerland. Their travels will also take them to colleges and oil firms in England and France.

Ansul Chemical Co. Names Larimer to New Sales Post

Ansul Chemical Co., Marinette, Wis., has announced the appointment of Paul R. Larimer as general sales manager in charge of fire extinguisher, refrigeration, industrial chemicals, and export sales divisions. This is a new post created by the company to help supervise and coordinate the company's sales expansion. Larimer formerly supervised the company's government-relations program, and served as assistant sales manager of the fire-extinguisher division.

Mission Receives Award From Magnolia Paper Co.

A. L. Jacobs, left, purchasing agent for Mission Manufacturing Co., receives a certificate of award from J. T. McSpadden, of Magnolia Paper Co., for the Mission E-Z Swab box, manufactured by Magnolia, and which won recognition at the 1952 Setup Paper Box Competition of the National Paper Box Manufacturers Association held in Chicago recently. The Mission award was the only one given to a member of the oil industry. The box, which carries a photograph of the Mission E-Z Swab on the lid, affords immediate brand identification and was considered an appropriate package for the product.

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Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EQUIPMENT FOR SALE

6,000' OF 4½" API. Full Hole Sonoscoped Drill Pipe. Also 4,000' of 3½" External EUE Drill Pipe. Milford Giffin, Tel. 477, Hoisington, Kansas.

FORT Worth model-D spudder complete with International power unit, tools for 22" diameter holes, $4500. Located near Los Alamos, New Mexico. Inventory furnished upon request. Texas Water Wells, Inc., 951 McCarty Drive, Houston, Texas.

FOR SALE: 1500 ft. new 11# line pipe, 1540 ft. used seamless. All 4½ and range two. C. H. Reser, Hamilton, Kansas. Ph. 2791.

BUCYRUS-ERIE 26-L, trailer mounted, in first-class condition with 65-ft. telescoping derrick complete with casing tackle, strut, auxiliary A-frame leg, and 4-sheave casing blocks. Powered by D-315 Caterpillar Diesel. Price $12,000.00. BUCYRUS-ERIE 24-L, trailer mounted in first-class condition with 55-ft. telescoping derrick. Powered by HP-326 Buda gasoline engine. Price: $5,000.00. Duval Drilling Co., 6505 Normandy Blvd., phone 8-5711, Jacksonville, Fla.

FOR SALE: Approximately four miles of SH 4" OD Good Heavy Pipe 20' lengths, straight and beveled. Isador Molk, Box 208, El Dorado, Kansas.

PIPE: 6200' of 3½" OD Range 1 Drill Pipe with 4¼" OD, 3½" Acme Tool Joints coupled into 40' lengths with Drill Pipe Couplings. $1.35 per foot. Acme Oil Tool Co., 1001 SE 29th, Oklahoma City.

FOR SALE
RECONDITIONED ROTARY EQUIPMENT

1—Wilson Giant Double Drum Single Engine Drawworks with Catheads, Drilling Line, powered with 225 H.P. Waukesha.

2—Unitized 6" x 16" Wilson-Snyder Power Pump, 3 runner Skids, V-Belt Drive and Guard, powered by RXIV LeRoi V-8 Engine.

1—Cardwell Model K Single Drum Rotary Drawworks Unitized on Lowboy Trailer with telescoping poles, powered by SRKU Waukesha.

1—Unitized and Lowboy Trailer mounted—6 x 12 Wilson-Snyder Power Pump with V-Belt Drive and Guard powered by 145 GKU Waukesha.

1—#OB-12-L Brewster Rotary.

8000 Feet—3½" OD Drill Pipe—Good condition.

Above is only a partial list of Reconditioned Rotary Equipment available.

EMPIRE MACHINERY CO.
Box 4026—Phone 6-9161
Odessa, Texas
Box 1978—Phone 4-8196
Abilene, Texas

EQUIPMENT FOR SALE

1 MODEL "K" Cardwell Double Drum Spudder. 145 GK Waukesha Motor. Skid mounted. ¾" Drilling 9/16" Sand Lines. These lines are 4000'. Tools for 7" and 5½" Hole. Hand Tools Tubing & Rod Tools Complete. Butane Tank, Steel Dog House. This Rig has Folding floor and Roof. Gaines Drilling Co., Box 547, El Dorado, Kansas. Phone 2317.

FOR SALE: 186 miles of 6⅝" O.D. x 18.97 lbs. Line Pipe, Single Random Length, Plain Ends beveled for welding and primed, now being taken up in Indiana and Illinois where line was operated under 850 lbs. working pressure. Material available for inspection. For further information please write or call: Commercial Metals Company, P. O. Box 1046, Dallas, Texas, HUnter 4651; Standard Pipe Supply Company, P. O. Box 243, Houston, Texas, CHarter 6976; Texas Pipe Supply Company, P. O. Box 1331, Houston, Texas, BLackstone 0101; Davidson Pipe Company, Inc., 2nd Avenue 50th-51st Streets, Brooklyn 32, New York, GEdney 9-6300.

USEFUL MECHANICAL PRODUCTS
needing
Introduction and Sales Representation
to
Oil—Gas—Chemical industries located in Ohio, West Virginia, and Western Pa.
by
Engineers with well developed contacts
Box E-938, The Oil and Gas Journal
Tulsa, Oklahoma

FOR SALE

1—Bessemer type ten with 17" overhead power cylinders. Compressor cylinders to suit purchaser.

1—Clark twin gas engine driven compressor with overhead power cylinders and compressor cylinder to suit purchaser.

1—Bessemer type ten single 80 hp. 16" overhead exhaust. Above machines completely rebuilt.

W. S. SMITH
Tulsa 2-5473 205 Thompson Bldg.
Tulsa, Okla.

DRILLING EQUIPMENT

1—Fred Cooper Double Drum Well Servicing Unit with Spudding Attachment. Equipped for Butane.

1—Steel Dog House mounted on new John Deere 4 wheel Trailer.

1—4 Wheel Trailer Heavy Duty (New) for hauling tools & flooring.

Complete unit Tools, Swabs and other equipment.

3500' of ⅞" Drilling and ⅝" Sand Lines for Cleaning out and Work over jobs.

GAINES DRILLING COMPANY
P. O. Box 547
El Dorado, Kansas

EQUIPMENT FOR SALE

FOR SALE: Cardwell Model "R" Drilling outfit consisting of double drum draw works, powered D-13000, skid mounted 7¼ Oilwell pump, powered D-17000, mast is ninety foot bender, subbases, 10 KW light plant, Linkbelt shaker, steel dog house, traveling blocks, swivel, tongs and rotary table. Write for complete inventory—The Ralph M. Parsons Company 617 South Olive Street, Los Angeles 14, California.

ONE 36 L Bucyrus-Erie Drilling Machine complete with 7" and 5" Tools, Tool Rack, Light Plant, Dog House, all complete, good lines, ready to go. Will sell right. Will give guarantee same as new unit. Write Texas Well Servicing Company, Box 1357, Borger, Texas. Phone 1721.

GASO Model 1860, 2½" to 4½" x 6" Duplex Power Pumps—Skid Mounted with Model K-428 BUDA Gasoline Engine—Unit Complete with V-Belt Drive, Belt Guard, etc.—Condition Guaranteed—6 Available.

HALLORAN EQUIPMENT CO.
5702 Harvey Wilson Dr., Houston 20, Tex.
Phone WAyside 5158, WEntworth 4511

ENGINES

3 Waukesha Hesselman Model 6LRHU, 240 BHP at 900 rpm. Brand new. Complete with all accessories, radiator to flywheel, gasoline engine starting. **Convertible for gas operation and electric starting.** $20,000.00 for the lot, f.o.b. New York. Available for inspection.

Box 29, Long Island City 1, New York

Used Seamless BOILER TUBES

2" O. D.
2¼" O. D.
3¼" O. D.
3½" O. D.
4" O. D.
5⅜" O. D.
5½" O. D.

Approximately 5 miles of each diameter available in single or double random lengths with beveled ends.

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X851)
Kansas City 18, Kansas
THatcher 9243

EQUIPMENT FOR SALE

OIL RIG for Sale: 45 Star spudder A-1 condition complete with tools, workshop and 3,000 foot sand line. Also will sell string of 7" and 8" casing with Rig. Contact B. N. Cardwell, Middlesboro, Kentucky.

TANK BATTERY: Two 200 barrel welded steel B S & B tanks steel walkaway and stairway, all connections. One 6' by 20' National oil treater. One 5' by 15' B S & B separator with pipe stand. One 122' angle iron derrick. S. & S. Pipe & Supply Company. Box 2513, Phone 50-9287, Tulsa, Oklahoma.

FOR SALE: 1-43C Heavy Duty Star Spudder A-1 Condition, complete with 10" to 5" Tools, Diesel Power and all necessary equipment to drill wells. Contact A. H. Alcock, Box 146, Office phone #301, Res. phone 2270, Chanute, Kansas.

FOR SALE: 1—25 AH Dodge Drilling Clutch Powered 145 GK Waukesha Engine. Good Condition. (Used). 1—50 AH Dodge Drilling Clutch Powered JL-1335 Buda Engine. Fine Condition (Used). 1—Young Drilling Unit Powered R6I Climax Engine in Good Condition. (Used). 1—2-720 Gal. Butane tank on skids, also a quantity Used Cable Drilling Tools of all kinds in Good Condition. Midway Tool Company, Box 248, Mt. Pleasant, Michigan.

1—Wilson Giant Rotary Rig 500 Transmission. 2—L. I. Cummins Diesel Motors. 1—7¼ x 14 Pump. 1—96' Moore Hi-Speed Mast Rig Complete. 15,000' 4½" O. D.—9.50 lb. Range 1 Casing, New. Box E-936, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

SPARTAN TRAILER

Field quarters and office, contains 3000 Watt Onan Generator, constant pressure water system with stainless steel storage tank, additional features, making it self sustaining away from all public utilities. Located for inspection in Tulsa, Okla. For additional information Box E-940, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE
USED REFINERY EQUIPMENT
Located in Michigan

ONE (1)—Vacuum Flash Tower; Top section contains 5 trays on 27" spacing. I.D. is 9 feet. Bottom section contains 5 trays on 27" spacing. I.D. is 6 ft. (11)—18" Manways on ½" thick shell.
ONE (1)—3' 6" O.D. Fractionating Tower containing 3 trays on 24" spacing. Design Pressure 25 P.S.I.G.
ONE (1)—5' x 17' Sulphur Tank; ⅜" Shell and Dished Heads.
ONE (1)—4' x 12' Distillate Receiver Tank; ⅜" shell and ½" Dished Heads.
ONE (1)—Water Tower welded; 100,000 gallon capacity mounted on 70' steel supports.
ONE (1)—150,000 gallon storage tank. Welded 16' high x 40' diameter.
TWO (2)—Pressure Tanks—80# 10' x 44' —25000 gallon capacity each. ⅝" shell, ¾" heads.
25,000 square feet of condenser and exchanger surface in various sizes. Expansion Joints; Ring type, 8" to 24". Valves; Electric Motor Driven.
Many other miscellaneous items such as pumps, valves, flanges, tube return bends, stacks, etc.
For further information write or contact Box E-920, The Oil and Gas Journal, Tulsa, Okla.

EQUIPMENT FOR SALE

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

MACHINE shop equipment, 2 lathes, 1 milling machine, 1 shaper, 1 drill press, 1 bolt threader. Machines driven through line shafts with 1½ hp. and 7½ hp. electric motors. Keyes Drilling Co., Box 1108, Roswell, N. M.

FOR SALE: One 36-L Bucyrus-Erie drilling machine, complete with tools. Also 1,942 ft., new 7 inch, 17 lb., H-40, range 2, seamless casing and 2,409 ft. of new 2⅜ inch, 4.60 lb., range 2, J-55, seamless regular tubing. Box E-812, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: One Wilson Mogul Double Drum Spudder equipped with rotary drive attachment, chain driven transmission, friction clutches in both drums, lower drum with two drives, upper drum with one drive, water circulating brakes on lower drum and with Foster friction spinner cathead and American Simplomatic breakout cathead. Powered by Waukesha 6-WAKU gas engine equipped with butane heat exchanger. Spudder has been completely reconditioned and motor is in excellent running condition. Has not been run since overhaul. Rig will be given 90 day guarantee. Priced reasonable. Box E-937, The Oil and Gas Journal, Tulsa, Oklahoma.

1—28-L BUCYRUS-ERIE Spudder complete with all tools, electric welder, light plants, dog house, GMC 6x6 Army truck and 1948 Federal truck inventory furnished upon request. Price: $13,000.00. Buckeye Supply Company, Zanesville, Ohio.

FOR SALE at Oklahoma City, Attention, T. P. Mace. 40,000' each, 3" and 4" standard, plain end, beveled line pipe, cleaned outside. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

PIPE
All sizes; line pipe and casing, tanks, and Oilfield supplies. Edco Pipe & Supply Co., Phone 45970. P.O. Box 151, Tulsa, Oklahoma.

FOR SALE: Fort Worth Super "J" Spudder with large assortment heavy cable tools and wire lines, also engine, propane tank and other miscellaneous equipment. A heavy duty rig for drilling in the Rocky Mountain Area. $15,000.00. Located at Chromo, Colorado, in the San Juan Basin. Subject to prior sale. Contact H. Blume Johnson, Butler-Johnson Service Corp., Shreveport, La., or W. J. Osterhoudt, Box 175, Durango, Colo.

FOR SALE: One model R Cardwell double drum hoist Serial No. RLGMD-687 powered by Model GK-145 Waukesha engine. New, never been used. Factory list price plus trucking and insurance. Fox Well Servicing Co., Box 488, Healdton, Okla. Phone 605.

WELL drilling equipment, new or used. Spudders, rotaries, core & shot hole drills, tools, pipe, bits, blocks, pump jacks, valves. Everything for well drilling and service. Fishing tools rented. Pressey & Son, Pueblo, Colo.

HELP WANTED

SEISMIC PERSONNEL needed for United States and Canada by well known and expanding contract geophysical company. Address Box E-863, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WE BUY well drilling equipment machines, cable tools, pipe, etc. Turn your surplus equipment into cash. Pressey & Son, Pueblo, Colorado.

WANTED: Three engine compound for Wilson Titan drawworks. Makin Drilling Company, Box 1628, Phone 3-3141, Hobbs, New Mexico.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma

WANTED
OIL DRILLING EQUIPMENT
and auxiliary equipment and supplies

Must be in excellent condition. Location immaterial. Furnish full details and descriptions including names of manufacturers, present condition, age, location, original cost, present asking price and when available.

Box E-944, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

OIL Industry Employment Service, 405 Tuloma Bldg., Tulsa, Okla. 4-5974, Tom Robinson, owner. For technical and trained personnel. Optional with applicant whether he or employer pays our fee.

ENGINEER REQUIRED

Graduate Engineer, fully experienced in Oil Refinery Engineering, to handle senior engineering detail of a modernization and expansion project for an Independent Refinery in Western Canada. Permanent position in senior capacity following completion of project. Please give full information, including age, education, experience and salary expected in first letter.

Box E-925

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

SALES REPRESENTATIVE WANTED

Established Plastic Pipe manufacturer wants high grade man of experience as general sales representative in Mid-Continent field. Write giving full information including salary requirement in first letter.

Box E-933

The Oil and Gas Journal
Tulsa, Oklahoma

PETROLEUM ENGINEER

A leading New York commercial bank wants an aggressive, self-starter with at least 10 years' petroleum engineering experience including field work.

Position calls for aiding in development of additional business as well as technical competence in review of oil and gas reserves and production cost estimates. Desire and ability to grasp financial aspects essential. Some travel required.

Salary commensurate with experience and ability. Reply in detail will be treated in confidence.

Address: Box 702, Church Street Station, New York 8, N. Y.

HELP WANTED

EXPERIENCED PETROLEUM ENGINEER under 40 years of age for small research and development group. Box E-907, The Oil and Gas Journal, Tulsa, Oklahoma .

CHEMIST EXPERIENCED in PETROLEUM PROCESSING or PETROLEUM RESEARCH, under 40 years of age for small research and development group. Box E-908, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Experienced seismic party chiefs, observers and computors for service in Central and South American countries. Must be prepared to fulfill two year contracts at appropriate salary. Assignments starting not later than December 1952. Write giving details of experience and education. Letters will be held confidential. Box E-928, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMIST for western Kansas refinery. To be responsible for refinery products control. Prefer some asphalt experience. Permanent position. Salary commensurate with experience and ability. Box E-942, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN with Law Degree. Independent Oil Company has opening for experienced landman with legal experience in South Texas area. Reply giving full particulars regarding education, experience and qualifications. Box E-941, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Purchasing agent for refinery and production operation. Must have sufficient experience in accounting ability to maintain perpetual inventories, meet government purchasing requirements, etc. Box E-939, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLER experienced in operating portable rotary machine. Core work and subsurface sampling for water well development. Work in Illinois and surrounding states. Box E-943, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—SEISMOGRAPH PARTY CHIEF. Must be fully qualified. Age 27-38. A good opportunity for the right man. Box E-770, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT SALES MANAGER for oil country tubular goods with a national manufacturer in territory western half of U. S. Position requires 10 to 15 years' sales experience in similar position or representing oil field supply house. Mid-Continent area preferred. Age 35 to 45. Salary open. Write, giving details of experience and training to Box E-902, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS, GEOLOGISTS, DRAFTSMEN, with field experience for Rocky Mtn. positions. Good future with both Majors and Independents. Write Professional Placement Service, 516 University Bldg., Denver, Colorado.

REFINERY EXECUTIVE

Independent integrated petroleum company has opening for manager of moderate size complete refinery. Experience with modern processing, labor relations, cost control, as well as organizing ability essential. Salary open. Prospects for the future are exceptionally good for a qualified man. All replies confidential. Box 930, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST

For subsurface work in Saudi Arabia. Degree plus 5 years' experience in well-sitting, and with some knowledge of micro-paleontology. Salary open.

Write giving personal history and work experience. Please include telephone number.

Box E-924
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

HELP WANTED

ENGINEER, CHEMICAL. Excellent opportunity with small, well established engineering company. Wide scope of independent work on process, design, operations, economies, patents, etc. Attractive location and working conditions. Some travel. Box E-929, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Exploration geologist 25-35. Degree plus 3-5 years experience subsurface and well sitting preferably with major company for work with large independent company, Oklahoma City. Salary open. Box E-947, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Man for investigation and purchase of oil and gas leases in proven fields. Must have background of administrative, as well as operations experience. Salary and expenses to a high caliber man. Box E-955, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

EXPERIENCED OIL AND GAS EXECUTIVE, age 39, Petroleum Engineer, University Oklahoma. Broad experience in petroleum engineering, sales, government, construction, gas utilities. Desire change to progressive oil and gas company. Presently employed, Senior Engineer, Gas Transmission Company. Preferable location Houston. Box E-903, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERINTENDENT. Graduate Petroleum Engineer. 12 years responsible experience producing industry. Geological ability. Mid-Continent or Rocky Mountains. Box E-774, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTING Major Desires Change. 3½ years experience, payroll, audits, income tax, reconciliation statements, paying bills, etc. Prefer Midwestern or Rocky Mountain. Box E-931, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 1638. Ph. No. 3-3141, Hobbs, New Mexico.

ASSISTANT REFINERY SUPERINTENDENT desires to relocate. 6 years in present position of responsibility for both process and mechanical phases of all refinery operations. Experienced in operation of fluid catalytic cracking units. Chemical engineering graduate, 9 years experience in process development, process design and technical service work for well-known engineering and development organization. Box E-945, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer desires to supervise drilling, completions and production for independents in West Central Texas on retainer basis. Box E-946, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Age 35—married—10 years major company experience in Arkansas, Mississippi, Louisiana, East and West Texas—desires position with small major or independent oil company, located in Fort Worth or Dallas area. Box E-950, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER, Ph.D. Chem. Eng. (1942). Nine years experience directing development and application of corrosion inhibitors in petroleum production and refining. Publications and patents. Desires responsible position in West, or foreign. Box E-954, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT: 12 yrs. foods, desires connection refinery, production, supplier, etc., accounting or related fields. Box E-949, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING EXECUTIVE

42, Doctorate Chemical Engineering, 17 years outstanding experience development, design, construction of organic, petrochemical, and heavy chemical plants. Wishes engineering-management position in medium or large chemical concern. Presently resigning as assistant chief engineer major heavy chemical producer. Salary $14,000. **Box E-953, The Oil and Gas Journal, Tulsa, Oklahoma.**

SITUATIONS WANTED

PROJECT Engineer-Estimator: Processing and boiler plants, utility and high-pressure piping, material-handling, structural framing, heavy foundations; present salary, $9,000. Box E-952, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM Engineer. Five years experience in production, reservoir engineering, and consulting work desires association with aggressive independent or consultant in southwest. Licensed. Box E-948, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL AVAILABLE

IMMEDIATE Capital Available for laying pipe lines and gathering systems in Texas. We are also interested in purchasing actively operating pipe lines and gathering systems. Box E-934, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

WANTED to buy a stripper lease. Box E-917, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL give 112 acre lease for 90 day drilling contract, 1 year lease, 5000' test. One time good producer, location Young County, Texas, Mary E. Criswell Survey, Abstract #1772, known as the J. W. Burnett sub-division Section 2, Block C. Reserve right to withdraw offer any time. Inquire Box 722, Clifton, Arizona.

FOR SALE: Oil and gas lease, Shelby County, Texas, between and near Trans-American & Atlantic active blocks, priced five to ten dollars per acre, write for information. C. A. Parker, Polley Hotel, Center, Texas.

FOR LEASE: The owners of the land and/or the mineral rights on 75,000 acres in Northeastern Louisiana would like to secure proposals for exploration and development on large or small acreages. One producer on the tract. Box E-864, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL pay cash instantly for leases (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver Colorado

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

BUSINESS OPPORTUNITIES

ARMAND TEDESCHI, Geophysical Surveys, Calif. only, Gas & Oil structures, Calistoga, Calif. Services guaranteed.

INDEPENDENT PRODUCER

has surface pipe, casing and tubing and wants good deal. Would trade pipe for interest in good well or will take farm out on proven or offset acreage, not over 9000'. Limited to Texas only.

Box E-892

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

ROYALTIES

260 ACRES Leases, 50 acres land owner's royalty. Originally 1000 bbl. oil wells, 12 M. gas vicinity. Pipe line, 38 gravity oil. ½ interest lease, royalty, well drilled through Dutcher sand, $4500.00 cash. L. Price, Coweta, Okla.

WILLISTON BASIN ROYALTIES

Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1233, Great Falls, Montana.

JACK EAGLE—Pay you immediately for your producing royalties and Overrides, absolutely no delay, send complete details. 706 City Nat'l Bldg., Okla. City, Okla REgent 6-7027.

PRODUCTION
We Will Buy

PRODUCING landowners royalty and producing leases. Any amount, any area. Confidential information required and furnished. A 1 Bank Reference.

COMBEST ROYALTY COMPANY
825-826 Amarillo Bldg.
Amarillo, Texas

GEOPHYSICAL SERVICE

WHY DRILL DRY HOLES!
PROVEN
GEO-PHYSICAL INSTRUMENT

Has definitely located commercial oil wells. Make exact drilling location. Determine approx. depth and thickness of oil pay zones. WORTH INVESTIGATING!

LEASES—LARGE BLOCKS
Montana—Nevada—Oregon—Washington

YOUNG AND CRITCHLOW
2031 NW Johnson St. Portland, Ore.

Rocky Mountain Area

(Continued from page 155)

treatment. This well, 20 miles north of the Croff area and 15 miles south of Beaver Lodge is an indicated new pool discovery if proved commercial.

The week was also marked by the completion of two more wells in the Beaver Lodge field by Amerada to bring the state's total of producers to 40, and the staking of four new field locations.

In Montana, the number of rotary rigs active rose to an all time high of 49 in contrast with a slight drop in the remainder of the region, but developments for the week were routine. New locations dropped off considerably, with the only wildcat a venture by Ajax Oil Co. of Billings in the Cedar Creek area of Dawson County. The Texas Co. is testing at least three possibilities in the wildcat series in Cedar Creek, with conclusive results not yet available.

WYOMING WILDCAT FAILURES

Fremont County: Sinclair Oil & Gas Co. 1 Susan Little Shield, NW NW NW 23-1s-1e (WRM), dry, TD 4,104 ft., Tensleep 4,065 ft.

Fremont Petroleum Co. 2 Unit, NW NW NW 36-33n-94w, dry, TD 623 ft., Tensleep 600 ft.

Natrona County: Delhi Oil Corp. and George Greer 1 State, SE NW 36-32n-78w, dry, TD 1,584 ft., Lakota 1,572 ft.

Niobrara County: Roy Sharp 2 Alter, SE NW NW 23-34n-64w, dry, TD 738 ft., lower Sundance 705 ft.

COLORADO WILDCAT FAILURES

Grand County: De Berard Cattle Co. 1 State, SE NW SW 27-4n-81w, dry, TD 4,705 ft., pre-Cambrian 4,195 ft.

Logan County: Northern Drilling & Producing Co. 1 State, NE SW NE 16-8n-49w, dry, TD 4,462 ft., Dakota 4,426 ft.

Morgan County: Northern Drilling & Producing Co. and Eddie Fisher 1 Robinson SE SE NW 7-6n-56w, dry, TD 6,102 ft., "F" sand 5,925 ft.

NEBRASKA SUCCESSFUL WILDCAT

Cheyenne County: E. J. Davis 1 Olsen, C NE SW 17-12n-52w, flow 820 M.c.f. gas per day through 20/64-in. choke, TD 5,435 ft., "J" sand 5,350 ft.

NEBRASKA WILDCAT FAILURES

Cherry County: British-American Oil Prod. Co. 1 Leach, SE SE NW 23-31n-38w, dry, TD 4,605 ft., Granite 4,596 ft.

Cheyenne County: Frontier Refining Co. and Scruggs, Operators 1 Shorts, NW SE SE 17-13n-51w, TD 4,897 ft., "J" sand 4,944 ft., suspended indefinitely.

Deep Rock Oil Co. 1 Lehmkuhl, NW SW SW 25-14n-47w, dry, TD 4,019 ft., Skull Creek 3,983 ft.

Roeser & Pendleton 1 Stein NE NE NE 22-15n-51w, dry, TD 5,142 ft., "J" sand 5,049 ft.

MONTANA WILDCAT FAILURES

Blaine County: Appell Drilling Co. 1 J. L. Sprinkle Land Co., SW SW SW 30-31n-19e, dry, TD 3,854 ft., Kootenai 3,150 ft.

B & R Gas & Oil Co. 1 Lohman, C NW NE 32-34n-18e, dry, TD 4,253 ft., Madison 4,134 ft.

Dawson County: Oceanic Oil Co. 1 Casterline C NE NE 4-22n-50e, dry, TD 8,014 ft., Lodgepole (?) 7,915 ft.

Petroleum County: Catlett-Frary-Taylor 1 Whittier, NE SW NW 27-16n-27e, dry, TD 2,280 ft., lower Amsden 2,251 ft.

NORTH DAKOTA WILDCAT FAILURES

Stutsman County: S. D. Johnson 1 John Rath, Jr., NE NE 30-137n-67w, dry, TD 3,374 ft., Red River 3,190 ft.

Williams County: Amerada Petroleum Co. 1-A North Dakota State "C" C SW NW 15-158n-95w, temporarily abandoned, TD 8,479 ft., Madison 8,037 ft.

Central Area

(Continued from page 156)

proved to be about 7 bbl. of oil and 3 bbl. of water. The water was believed to either be drilling fluid, or to be coming from the upper pay zone, or both. A showing of water in the Richfield is not uncommon in most all Richfield oil pools.

On the basis of sample analysis of the best pay at the 1 Weiler, one reliable geologist estimated that well might flow as much as 75 bbl. of oil a day after acid treatment, but on the basis of the fluid showing on test, it appeared to others that well as it then stood was typical of other area Richfield wells (in Rose City pool) which showed for from 30 to 40 bbl. day after a comparable natural showing had been acidized. However, if this is a typical Richfield section, additional pays may be logged before the black lime is logged.

This is the first well on the West Branch structure to show for potential commercial completion in the Richfield. A better estimate of this possible deeper horizon discovery should be available after the deepening, testing and acidizing.

ILLINOIS WILDCAT FAILURES

Bond County: T. M. Conray 3 Wegman, NW NE NW 32-4n-3w, dry, TD 1,077 ft.

Edwards County: F. J. Fleming 1 Bunnage, NW SE SW 19-1s-10e, dry, TD 3,474 ft.

Gallatin County: George S. Engle 1-B Lightner, NW SE NE 31-7s-10e, dry, TD 2,927 ft.

Jasper County: Murvin & Steber 1 Lindsay, NE NE NW 7-7n-14w, dry, TD 2,185 ft.

Murvin & Steber 1 Farley, E½ SE SW 6-7n-14w, dry, TD 2,186 ft.

Jefferson County: Murvin & Steber 1 Quinn, NE NE SW 1-3s-2e, dry, TD 3,336 ft.

Lawrence County: J. W. Rudy 1 Baldwin heirs, SW NW NW 29-5n-12w, dry, TD 1,810 ft.

Montgomery County: O. A. Reed 1 Wernsing, NE SE NW 11-10n-4w, dry, TD 622 ft.

Perry County: Theodore Glass 1 Stelmar, NE SW SE 10-4s-1w, dry, TD 1,235 ft.

Shelby County: Roy J. Heathcock 1 Hundertpfund, NE NW SE 17-9n-4e, dry, TD 1,888 ft.

Wayne County: Collins Brothers 1 Hart, SW NW NE 16-1s-9e, dry, TD 3,465 ft.

White County: Paco Petroleum Co. 1 Rudolph, SW NW SE 3-5s-10e, dry, TD 3,229 ft.

E. A. Obering 1 Ramsey, NE NE NE 9-5s-8e, dry, TD 3,571 ft.

INDIANA WILDCAT FAILURES

Crawford County: D. R. Snyder-H. H. Vickers 1 Brown, NW NW NE 26-2s-1w, dry, TD 1,425 ft.

Gibson County: Dee Miller Drilling Co. 1 Steelman, Military Donation 59-1s-10w, dry, TD 1,907 ft.

Knox County: Aurora Gasoline Co. 1 Johnson, SE NW NW 13-1n-10w, dry, TD 1,783 ft.

Monroe County: H. Burton 1 Mitchell, SW NW SW 18-7n-1e, dry, TD 824 ft.

Parke County: L. Kneirim 1 Polette, SW NE NW 5-16n-8w, dry, 1,255 ft.

Pike County: C. S. Higgins 1 English, NW SW SE 10-1s-8w, dry, TD 1,518 ft.

L. P. Galambos 1 Werner, NE SE SE 2-1s-7w, dry, TD 2,700 ft.

Sullivan County: E. Nash 1 Wyman, SE NE NW 5-8n-9w, dry, TD 874 ft.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: Stanco et al 1 Brown, SE SW NE NE 22-Q-25, dry, TD 2,300 ft.

Iglehart Drilling Co. 1 Muncaster, NL SW NE SW 16-P-23, dry, TD 2,700 ft.

Westfall Drilling Co. 1 Sigler, SW SW NW SE 13-O-22, dry, TD 2,607 ft.

G. A. Hoffman et al 1 L. Polley heirs, SL NW SW NW 15-O-22, dry, TD 2,769 ft.

Logan County: R. Halbert 1 Hopper, SW NW SW NW 19-F-33, dry, TD 1,721 ft.

Webster County: Al Morris Drilling Co. 1 Gibson, S½ SW SE SW 12-N-22, dry, TD 2,300 ft.

MICHIGAN WILDCAT FAILURES

Newaygo County, Denver Township: Admiral Oil Corp. 1 Gilbert, NW NE SW 10-14n-14w, Traverse 2,121 ft., dry, TD 2,135 ft.

Otsego County, Hayes Township: Pure Oil Co. 1 Lake Horicon Corp. N½ SW SW 11-29n-4w, dry in Richfield, TD 3,688 ft.

Ottawa County, Georgetown Township: W. B. Karke 1 Lowing, NW SW SW 3-6n-13w, Traverse 1,928 ft., dry, TD 1,945 ft.

Saginaw County, Birch Run Township: F. O. Jordan 1 Sheppard, SW NE SE 25-10n-6e, Berea 1,495 ft., dry, TD 1,531 ft.

Texas Gulf Coast

(Continued from page 152)

south of West Muldoon field, Sutton Drilling Co. will attempt to cut a new fault and establish production in the Wilcox at 1-B E. A. Arnim, scheduled to get underway immediately on a 2,500-ft. contract depth. Operator intends to establish a new reservoir in the Wilcox on the south end of the William Kuykendall ½ League, A-219.

Fifteen miles northwest of Beeville, Warren Petroleum Corp. has reported that recovery on a drill-stem test in the Slick sand was of commercial quantity, but that it was not gaged. Top of the Slick sand was called at 7,313 ft. Another drill-stem test in the Uling sand, 7,461-72 ft., recovered salt water. Location for the 1 Mrs. Rosa E. Borroum is on the C. Williams Survey, A-511, in Bee County.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Polk County: Currie B. Davis 1 Charley M. Broman, Augustine Viesca Sur., A-77, TD 3,442.5 ft., IP 77 bbl. of oil per day on 1/8-in. choke, 31.1°-gravity, gas oil ratio 309:1.

San Jacinto County: C. C. Gilger Drilling & Exploration Co., Inc. 1 Emma Bell, J. D. Martinez Sur. 4, A-34, TD 8,200 ft., IP 3,750,000 cu. ft. of gas per day on open flow, 245 bbl. of oil per day on 3/16-in. choke, 60.8°-gravity oil.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

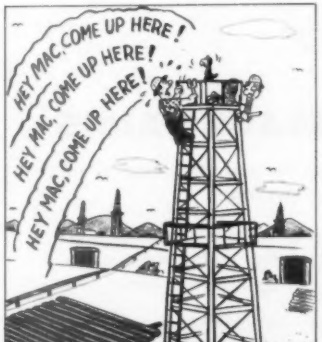
Colorado County: Warren Petroleum Corp. 1 Joe J. Hanak, W. K. Paulding Sur., A-403, dry, TD 4,200 ft.

Galveston County: Sun Oil Co. 2 State Tr. 179, St. of Texas Tr. 179, East Bay, dry, TD 10,600 ft.

Jackson County: Hankamer Investment Co. 2 Herman S. White Est., S. F. Austin Sur., dry, TD 7,731 ft.

Hassie Hunt Trust 1 Vera Allen et al, Jos. Rector Sur., dry, TD 7,060 ft.

Newton County: L. D. Cain 1 Kirby-Drenman, Drenman Sur., A-109, dry, TD 8,520 ft.



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Kansas Fields

(Continued from page 152)

Capitt 1 Qualls, SW SW NW 17-29s-5e, dry, TD 2,913 ft.

Ellis County: Stearns 1 Albrecht, NW NW SE 11-11s-16w, dry, TD 3,705 ft.

Graham County: Empire Drilling Co. 1 Goddard, NW SW NW 21-7s-24w, dry, TD 4,334 ft.

McPherson County: Anschutz Drilling Co. 1 Vosholtz, NW NW NW 15-19s-1w, dry, TD 2,974 ft.

Reno County: Transit 1 Welker, NE NW NE 14-22s-8w, dry, TD 3,640 ft.

Rooks County: Republic Natural 1 Schneider, NW NW NW 10-8s-19w, dry, TD 3,505 ft.

Seward County: Lansekan 1 Good, CWL NE NW 16-34s-31w, dry, TD 5,959 ft.

EASTERN NEBRASKA WILDCAT FAILURES

Cherry County: Ashland 1 Hanna, SE NE NE 28-28n-30w, dry, TD 4,252 ft.

Hall County: Ward-F. Fisher et al 1 State, SE SE SE 36-9n-12w, dry, TD 3,960 ft.

Lincoln County: P. B. Johnson et al 1 Darling, SW SW NW 22-12n-30w, dry, TD 2,834 ft.

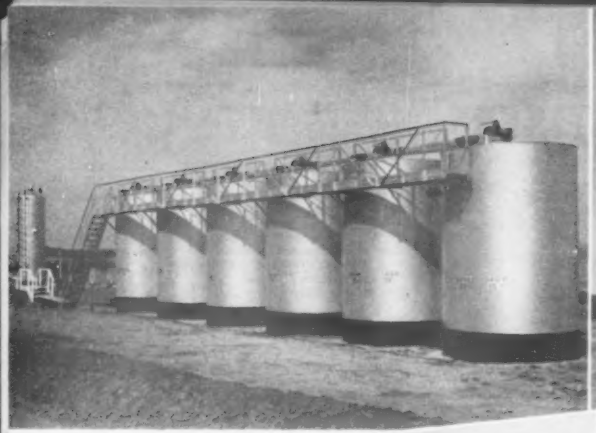
Loup County: S. D. Johnson 1 Nichlas, NW NW NW 13-24n-18w, dry, 3,198 ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, Washington 25, D. C. Notice is hereby given that two parcels of land in T. 5 S., R. 104 W., 6th P.M., Colorado, containing approximately 232 acres, within the known geologic structure of the Urado field, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 p. m., Eastern Standard Time, September 17, 1952, when bids will be opened. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Manager of the Land and Survey Office, Denver, Colorado, or to this office. Marion Clawson, Director.

LEGAL

U.S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the SE¼SE¼ sec. 10, T. 19 N., R. 5 E., La M., containing 40 acres, within the known geologic structure of the Monroe field, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 1 p.m., Eastern Standard Time, on September 24, 1952, when bids will be opened. Details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to this office. Marion Clawson, Director.



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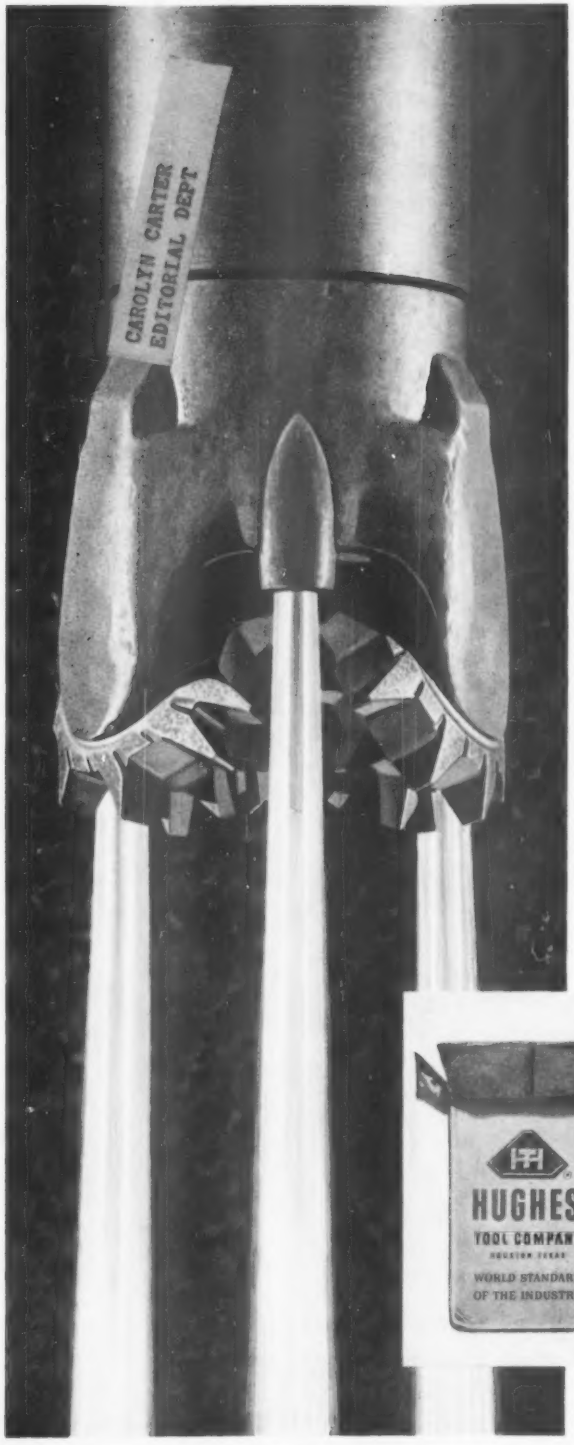

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